COAL AGE

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In response to our request, inviting readers to prepare short articles for us suitable for publication as a Foreword on this page, several dozen manuscripts have been submitted. A few will be printed here; others not adapted will appear in the body of our paper. The following discussion on "Bounces" was written for us by A. C. Watts, chief engineer, Utah Fuel Co., Salt Lake City:

That class of phenomena called "Bounces," or in some localities, referred to as "outbursts", "bumps" or "thrusts", has come to be recognized as a serious addition to the long list of dangers encountered in the mining of coal.

In the U.S.G.S. bulletin No. 424 the subject has the following mention made of it:—"When the room-and-pillar method is used in deep workings,....., there sometimes occurs an explosion or blowing to pieces of the pillars over a considerable area in the mine. This phenomenon, known to the English miners as "outburst" is believed by some of them to be due to the pressure of gas in the coal. This gas forces out the coal face with the violence of an explosion. Some observers believe that these outbursts are most prevalent in coals subject to spontaneous combustion, and that usually they may not be expected at depths less than 1,500 feet. Boring holes in the coal, also in the roof and floor, for the purpose of allowing the gas to escape, has been suggested as one remedy, and changing from the room-and-pillar system of mining to the longwall method is another."

Bounces in Utah are due to the heavy roof pressure and not the pressure of gas, for, while they have occurred in mines where an explosive atmosphere is generated, they have never been accompanied by outbursts of large quantities of gas. They seldom happen where the cover is less than 1000 ft. thick, and the overlying and underlying strata generally consist of sandstones and shales with the former composing most of the material.

With the usual method of allowing the pillars to stand for a long time, the caves do not relieve the strain and all the weight of the cover comes on the pillars, so that when the drawing of them is begun, the trouble with bounces commences.

The conditions which seem to be most conducive to bounces are as follows:—1. Thick cover, from 1,000 feet up. 2. Hard, brittle coal which sticks more or less to roof and floor. 3. Firm, cohesive roof and floor. 4. Room-and-pillar workings with insufficient pillars. 5. Improper method of drawing pillars.

The usual method of working mines heretofore has been to drive the hoist roads up or down the pitch with levels to each side. The rooms are driven on the face cleavages of the coal which places them at about 45 deg. to the direction of the level entries. Pillar drawing was left until the entries had reached their limits and then commenced from the inside and worked back, or the room pillars were drawn to within 50 to 100 ft. from the entries and the entries left open for one cause or another for some time before the entry stumps and chain pillars were drawn.

Thus, often the entry stumps and chain pillars were far behind the room pillars and had to take a great weight, especially if the roof had not caved. They might stand thus for long periods of time, but when any mining was done in them, the equilibrium would be destroyed and the bounce occur without warning.

In the working of old portions of mines, sure preventative measures cannot always be taken although the building of cribs has been successful. This is an expensive operation as the cribs have to extend over a considerable territory. The drilling of holes in the roof, floor and coal would not be of benefit as there is no large amount of gas. Longwall mining is not successful on account of the nature of the roof.

Probably the best way to overcome the trouble is to have larger pillars, or lay out the mine in panels and draw the pillars with long even faces so that the roof would have a good line to break to and could cave behind the work. The method of leaving entry stumps and chain pillars to the last is altogether wrong and invites trouble.

The danger from these bounces lies not alone in the dynamic forces involved, but in the fact that large quantities of dust are generated and thrown into the mine atmosphere. The dusts of Utah are inflammable and are readily ignited by open lights. While the force of the bounce will extinguish all lights, the natural tendency of the workman, if he is able to do so, is to relight his lamp and get out as quickly as possible.

To light a match in the dust-laden atmosphere means at best a trip to the hospital and may mean a disastrous explosion. For this reason only safety lamps are used in the pillar workings of mines where bounces occur, and the miners are supplied with hose to wet down the dust frequently, and are not allowed to depend on the regular watermen. As the balance of the mine is always kept in a wet condition, the ignition of dust has been confined to a limited area, and since safety lamps have been adopted no small dust explosions have occurred.

The Mine Telephone of Today

By E. L. Cole

A description of the modern ironclad type of mine telephone. The best methods of line installation, systems of wiring, and the general construction of the telephone itself are discussed. The article concludes with a list of the common faults which develop in telephone lines, together with their remedies.

For many years the only means of communication in our coal mines was the speaking tube, familiar to all who have had anything to do with coal mining. At best they were inefficient, but for many years they were the only means of communication available. Some years ago, however, one of the largest of the coal-producing companies purchased two telephones for use in one of their shafts, in the hope that better communication could be effected between the hoisting engineer and the employee at the bottom of the shaft.

For a time they operated very satisfactorily, but as the demand for them increased it became evident, that, to insure uninterrupted service, it would be necessary to design a telephone that would stand the rough usuage and the severe climatic conditions of coal mines. Consequently telephone manufacturers, with the coöperation of mining men, have succeeded in placing on the market a type of telephone that meets, in a large measure, with the rigid requirements of underground service. Thus it may be readily seen that the ironclad mine telephone was born of necessity and all telephone engineers agree in the verdict that it is a decided improvement over the wooden box type.

Location of Telephones

The question always arises as to the best location for each telephone. This question should certainly be decided by the mine officer whose duties require that he be in constant communication with the important parts of his colliery. There should be no hard and fast rule. It is obvious, however, that a telephone should be installed in each engine house, at each level of shaft and slope, and at such points in the interior of the mine where employees meet in the discharge of their duties, such as fireboss stations, main turnouts, etc. Fig. 1 is a plan of a typical telephone system installed in a large anthracite coal mine, showing the location of the telephones.

Line Construction

On account of the high standard which modern practice demands, an uptodate installation requires a much larger initial monetary outlay than a less substantial installation. The expenditure, however, is easily compensated by the excellent service obtained and the freedom from annoying breakdowns.

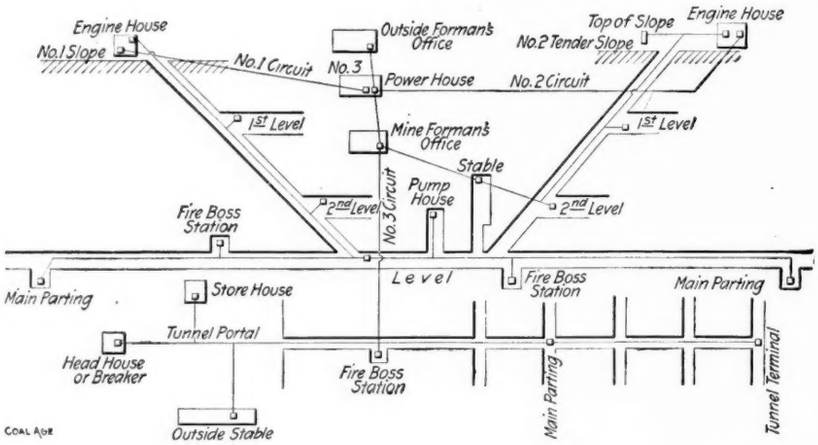


FIG. 1. A TYPICAL TELEPHONE SYSTEM, SHOWING LOCATION OF TELEPHONES

In mines that are free from moisture it is considered good practice to install lines of No. 14 rubber-covered copper wire, made up into a cable of as many pairs as may be required. The rubber-covered wire is in turn covered with a tough sheet of pliable fiber, from which it derives the trade name, circular loom cable. This type of cable is supported by porcelain insulators either from the roof, as in Fig. 2, or by timber supports, as in Fig. 3. It has given excellent service everywhere except in locations where only an absolutely waterproof cable will serve, and has the advantage of being inexpensive and easily handled. The labor cost of installation very seldom exceeds more than ½c. per ft. Sometimes a considerable saving in copper wire can be affected by running the cable down a borehole as shown in Fig. 4. Although the cable is well insulated, care should always be exercised to further insulate it from the roof by the use of the porcelain insulators, since this prevents abrasion of the insulation due to line stresses.

When conditions are such that only the installation of a waterproof cable can be considered, it will be found best to install a lead-covered armored cable. The installation of a plain lead-covered cable is a hazardous investment. Many cases are known where lead cables have been seriously damaged after being placed in position in shafts and slopes through the carelessness of mine employees.

To overcome this difficulty an armored cable has been designed. The principal

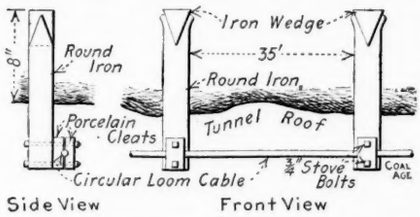


FIG. 2. METHOD OF SUPPORTING CABLE FROM ROOF

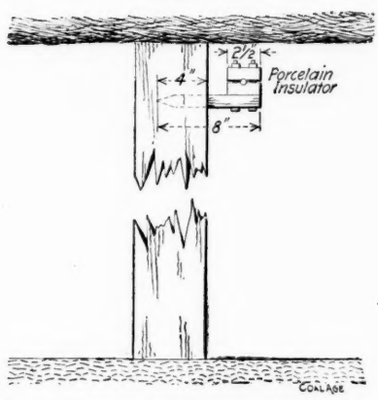


FIG. 3. METHOD OF SUPPORTING CABLES FROM PILLARS

objection to this seems to be that it is heavy and hard to handle. A rigging is shown in Fig. 6, which may be used to advantage in the installation of one of these armored cables. It is made up of three gear wheels, with 72 teeth and 4 ft. in diameter, and two pinion wheels with 6 teeth and 4 in. in diameter. The gear wheel on the cable reel is secured by four ¾-in. lag screws that pass through the holes bored in the spokes of the gear wheel. The shafts are usually 3½ in. in diameter and are housed in standard shaft housings. On the rear shaft is mounted a double-flanged pulley

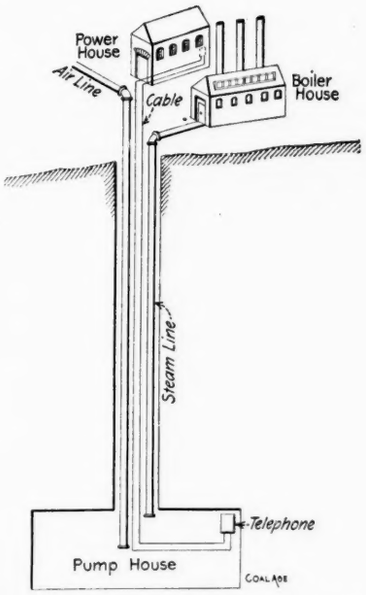


FIG. 4. CABLE RUN DOWN A BORE HOLE

wheel, 24 in. in diameter and 8 in. wide, on which a brake band presses when pressure is applied to the lever. The gears, shafting and reel are mounted on six pieces of heavy timber and can be readily put together and dismantled for transporting from place to place. There are usually found at coal mines suitable gear and pinion wheels which can be used for this purpose. By the use of this rigging the work of installing will be unattended by mishaps, and the cost of installation will be obtained at a minimum figure.

TYPES OF TELEPHONE

It may be safely said that the only type of telephone in coal mines where moisture is prevalent is the ironclad. This type consists of a sheet-iron box for the mechanical protection of the wood-type telephone. Note, in Fig. 5, that the roof slopes toward the front for the purpose of drawing off any possible water that may drop from the mine roof, instead of allowing it to collect at the back. The sheet-iron door, when closed, amply protects the instrument from moisture. In locations where the air is dry a saving can be affected by installing the usual wall-type incased in wood.

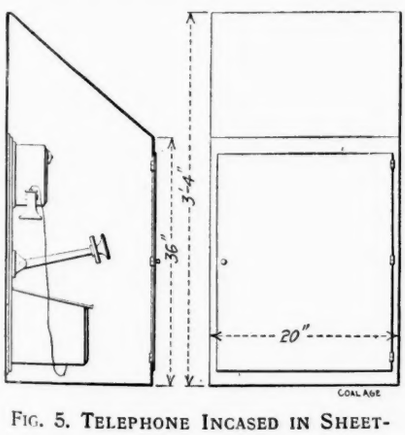


FIG. 5. TELEPHONE INCASED IN SHEET-IRON BOX

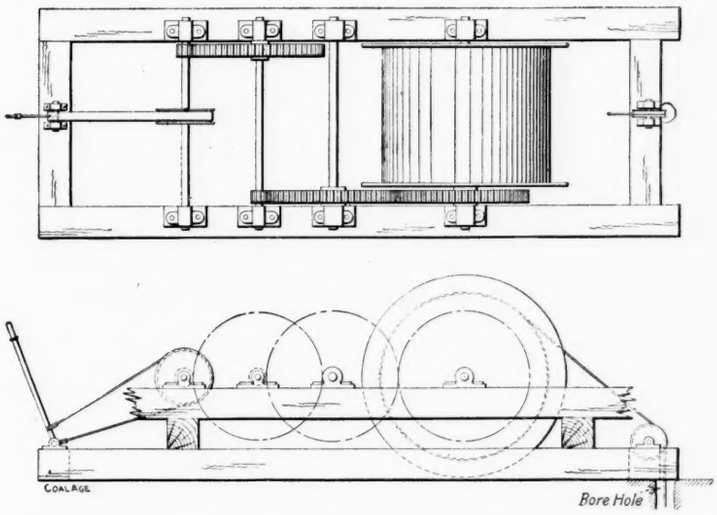


FIG. 6. A RIGGING EMPLOYED TO INSTALL HEAVY ARMORED CABLES

SYSTEM OF WIRING

A wiring diagram of a typical telephone system in one of the largest coal mines in Pennsylvania is shown in Fig. 7. It will be noted that 8 telephones are the maximum number on any one circuit, although some authorities recommend not more than 5. In mine practice, however, it will be found that 8 will give excellent service.

The omission of a central switchboard is considered poor practice by some telephone engineers, but due to the peculiar conditions met with in coal mines, the switchboard can be dispensed with without sacrificing the quality of the service, and, at the same time, effecting a saving by omitting the labor cost of switchboard attendants. Those, conversant with mining conditions will readily note, by referring to Fig. 1, that the telephones are laid out in three separate groups, each group being located in that particular part of the colliery that of necessity requires the employees to be in constant communication with each other. By means of jack boxes equipped with extension bells located in No. 1 and No. 3 engine houses, the three telephone circuits can be connected together and form one circuit, affording means of communication between any two telephones either in or outside of the coal mine. When a telephone is installed in an engine room, it is well to have it so placed that the engineer can make use of it without leaving his position at the throttle. Fig. 9 shows the telephone and jack box installed within easy reach of the engineer.

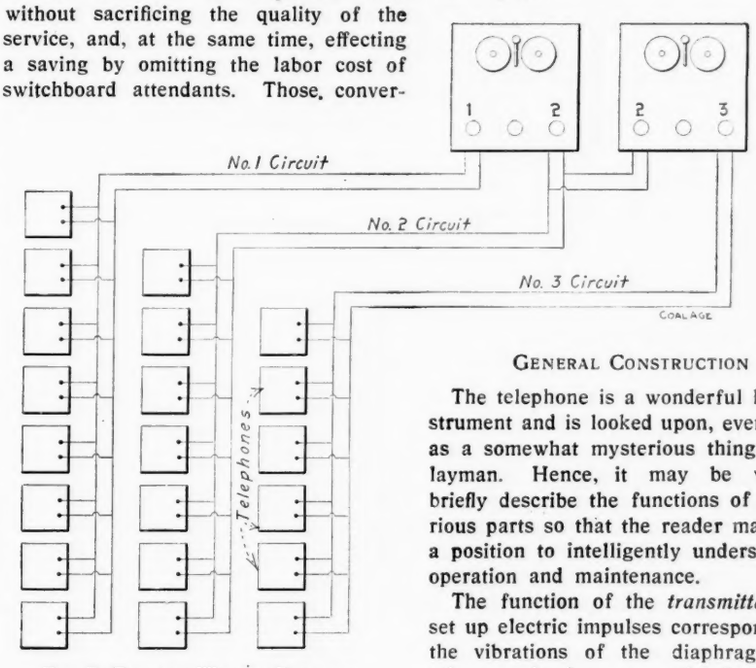


FIG. 7. TYPICAL WIRING DIAGRAM

GENERAL CONSTRUCTION

The telephone is a wonderful little instrument and is looked upon, even today, as a somewhat mysterious thing by the layman. Hence, it may be well to briefly describe the functions of the various parts so that the reader may be in a position to intelligently understand its operation and maintenance.

The function of the *transmitter* is to set up electric impulses corresponding to the vibrations of the diaphragm. In other words, it governs the flow of the

battery current so as to render possible the transmission to a distant point of sounds spoken against its diaphragm. The several types on the market today are but a modification of the original Hunning type, invented in 1881.

The *receiver* catches the fluctuating current coming over the line, thus varying the pull of the magnet on the iron diaphragm, and this action causes the diaphragm to vibrate according to the current transmitted over the line, and in harmony with the original vibrations of the transmitter.

The low-voltage direct current from the batteries is transformed into a high-pressure alternating current that makes the transmission of speech over long distances possible by means of an *induction coil.*

The object of the *automatic hook* is to cut out the ringing circuit while the talking circuit is in use, and *vice versa*; that is, when the receiver is on the hook the ringing circuit is complete; when the receiver is off the hook the talking circuit is complete and the ringing circuit is cut out.

drawing may be bridged across No. 1 circuit, or No. 2 circuit, or both.

The purpose of the *generator* is to furnish current for the ringing of the bells of all telephones in its circuit. For mine work, four bar generators have been adopted as standards by some of the largest users, with good results.

When it is desired to extend a telephone call to a point beyond, a set of ringer movements called *extension bells* is used for the purpose. It should be

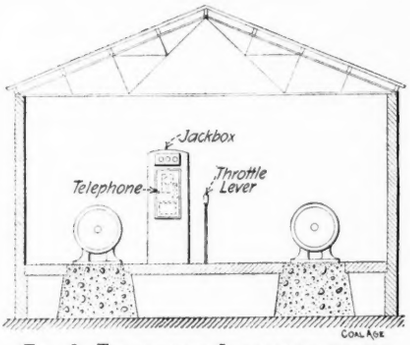


FIG. 9. TELEPHONE INSTALLED IN AN ENGINE ROOM

mentioned parts are in good conditions, the sound will be reproduced in the receiver and the clicking of the hook switch as it makes and breaks the circuit will be plainly indicated. It is obvious that if the sounds are reproduced the trouble is not in any of the parts mentioned and must be looked for in the line, generator or ringer movement.

When making the above test, if the trouble is indicated in any of the parts mentioned, it will be found best to ascertain the conditions of the batteries. For this purpose it is necessary that a volt-ammeter be used. Test first for voltage, second for amperage, being careful to test each battery by itself and, if any is found below normal insert a new battery. See that the battery compartments are free from moisture, as otherwise the batteries will be short-lived due to the short-circuiting of the zinc electrode.

Try all connecting screws, tightening any that may be loose, and scrape with a piece of emery paper any contacts that may be corroded from the damp atmos-

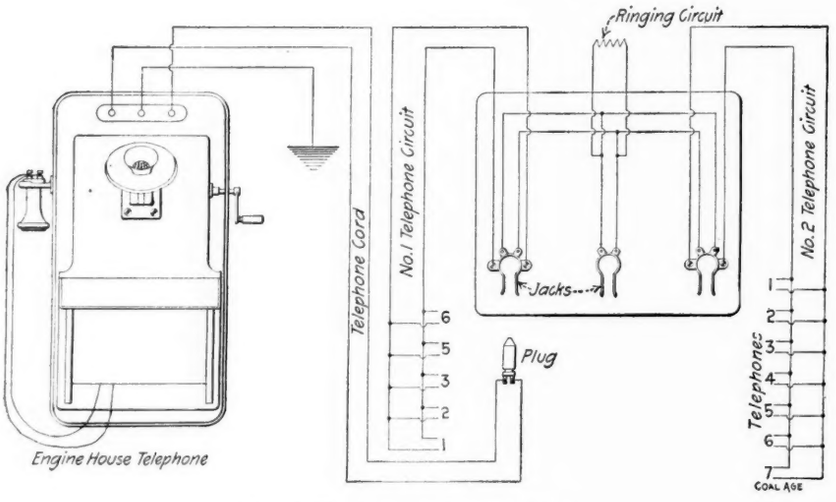


FIG. 8. TELEPHONE AND JACK-BOX

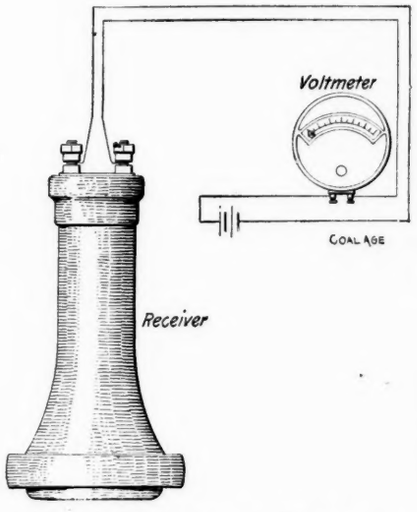


FIG. 10. TESTING THE RECEIVER

The direct current is supplied by the *batteries* which are connected from the circuit to the transmitter and induction coil. By means of these the low direct current is changed to a rapidly alternating current. The tendency of mine employees is to ascribe all telephone troubles to the battery and, to remedy this difficulty, they will dump more sal amoniac into the wet cell. This usually causes a short-circuit and renders useless the carbon electrode. Hence, the best type of battery is the dry cell.

Bridging is a term applied to an arrangement of telephones whereby any two stations can communicate with each other without going to the circuit of the other telephone on the line. Fig. 8 shows an engine-house telephone and jack box by means of which the bridge is accomplished. The 'phone in the

noted that these extension bells must be of the same resistance as all other ringer movements on the circuit.

LOCATING A FAULT

The best designed and constructed telephone system will from time to time develop faults. The rapid detection of a fault in telephones requires a knowledge of the function of the various parts and a little common sense. When called to remedy a telephone trouble the best plan is to alter nothing until you are absolutely sure where the fault lies.

A simple method of testing batteries, hook switch, induction coils, transmitter and receiver, is to hold the receiver to the ear in the same manner as in conversation and blow into the transmitter, at the time slowly moving the hook switch up and down. When the above-

phere. Test the battery wires where they connect to the binding post. Next inspect the generator. See that the automatic hook makes and breaks when it is moved up and down. Inspect the ringer adjustment, adjusting the striker if it is out of place.

The receiver cord is one of the most prolific sources of trouble. A simple method of testing it for broken circuits is shown in Fig. 10. In fact this diagram will be found of much assistance in searching for open and short-circuits through the entire telephone.

FAULTS AND REMEDIES

The following are the faults which usually arise, their causes and remedies:

Receiver—(1) Bells ring, but cannot talk. *Remedy*—Look for weak receiver,

poor connection; diaphragm bent out of position; hard-rubber shield out of adjustment, due to atmospheric conditions; hook switch out of adjustment.

(2) Message can be transmitted, but not received. *Remedy*—Look for short-circuit and open circuit in receiver.

(3) The voice makes and breaks when talking. *Remedy*—Look for loose connections, soldering all joints and using jamb nuts will prevent such trouble.

Transmitter—(1) Speech received strong, but transmission is weak. *Remedy*—Batteries weak, carbon packed in transmitter.

(2) Speech received poorly with scratching noise. *Remedy*—Batteries too strong, loose battery connection.

(3) Speech received but unable to transmit. *Remedy*—Transmitter circuit open or short-circuited; transmitter weak, bad induction coil.

(4) Speech indistinct, grating noise. *Remedy*—Bad transmitter, carbon diaphragm buckled or cracked, loose connections.

Ringer Movement—(1) Bell rings feebly. *Remedy*—Striker out of adjustment; too many telephones on circuit, partial ground, weak generator out of adjustment.

(2) Bells ring irregularly. *Remedy*—Loose connection in ringer movement, striker out of adjustment.

(3) Bells do not ring. *Remedy*—Open circuit in ringer movement; armature circuit, open or short-circuited; poor connection.

Magneto—(1) Transmit and receive a ring feebly. *Remedy*—Poor connection in line or in generator box, partial short-circuit, partially grounded.

(2) Rings other bells strongly, but its own weakly. *Remedy*—Resistance crossed, grounded line, poor connection.

(3) Receives rings, but will not ring its own bells. *Remedy*—Wire broken in generator circuit; armature short-circuited, striker out of adjustment.

(4) Rings all other bells feebly, but receives rings strong. *Remedy*—Armature partially short-circuited, generator magnet weak, poor connection on generator.

(5) Bell does not ring on being called or in calling, but can talk. *Remedy*—Open circuit or short-circuit in generator box.

(6) Bell rings, but no answer received. *Remedy*—Line open.

(7) Telephone can be called, but cannot call others. *Remedy*—Look for weakness in generator.

(8) Telephone cannot be called, but can call others. *Remedy*—Look for imperfect bell adjustment or short-circuit in ringer winding.

In closing it may be well to say that the construction of mine telephone systems in accordance with the lines laid down in this article recently enabled the general manager of a large coal-mining company to be in constant communication with his employees who were fighting a fire in a coal mine 1100 ft. deep, at a point three miles away from the bottom of the shaft. Had the telephone system, in this particular instance, been of inferior construction, it would not have been possible for him to be in constant communication with his employees at such an important time, as they were located at a point 38 miles away from the general manager's office.

Further Notes on Coal Impurities

By Wm. B. Phillips*

A discussion of a previous article on this subject by F. R. Wadleigh. The author agrees with the first monograph in the main but takes exception to certain classifications given and points out the necessity of a more thorough study of the coal ashes. He is also of the opinion that the present methods of writing coal specifications should be readjusted.

*Director, Bur. Econ. Geol. and Tech., Univ. of Texas, Austin.

I have read with pleasure and profit F. R. Wadleigh's "Notes on the Impurities in Coal," which appeared in COAL AGE of June 22, especially that portion of it which deals with clinkering. He justly remarks that scientific literature on the subject of impurities in coal is not only scanty but also quite unsatisfactory.

OXYGEN AS AN IMPURITY

But before discussing this subject I think that we should agree upon the definition of the term. I am unable to agree with Mr. Wadleigh in his statement that oxygen is an impurity, for what is essential in a coal cannot be considered an impurity. Analyses of coals that show no oxygen are so rare that I cannot recall a single instance. All coals contain oxygen as an essential ingredient and while it may detract from the fuel value, yet it is impossible to get rid of it. We should limit the meaning of the word "impurity" to such materials as may be economically removed, and not include those that are really part of the coal.

Oxygen cannot be considered an impurity in the same sense as pyrite, slate or bone. In so far as concerns any practical methods for removing it we may, I think, agree at the very beginning that it is impossible. By its union with the hydrogen of the coal to form water, it lowers the temperature of combustion and in this respect is a detriment but not an impurity. One of its effects is, probably, to diminish the available hydrogen and in this way decrease the amount which can combine with the carbon in the formation of some one or more of the gases from which the greatest number of heat units may be obtained.

Furthermore, it is not improbable that some of the important reactions, which occur in the destructive distillation of coal, are dependent on the oxygen of the coal itself. It may or may not be the case that all of the oxygen is to be considered as combining with hydrogen to form water, nor has it been proved that the water thus produced remains as such during the entire process of distillation.

CLINKERING

But what interested me most was what Mr. Wadleigh had to say relative to clinkering. His remarks are timely and full of good sense. If, in what I have to say I may appear to take issue with him unduly, it is from no spirit of carping criticism, but merely in an endeavor to point out some things which seem to have been overlooked. Mr. Wadleigh quotes from Bulletin No. 3, Fuel Testing Company, certain determinations of the fusing points of ash and remarks that there is absolutely no relation between the sulphur content and this fusing temperature. At the same time he remarks, near the close of his excellent article, that while pyrite has no fuel value it may be one of the causes of clinkering. If the substance which carries more than 50 per cent. of sulphur may be one of the causes of clinkering, it is difficult to see why there should be no relation between the content of sulphur and the fusing point of the ash.

FUSIBILITY OF THE ASH

It is not of much moment to quote determinations of the fusing point of ash ulness complete chemical anaylses of same are given, and not merely the oxide of iron content. Furthermore, the percentage of sulphur in the ash is not given in this table. The percentage of sulphur in the coal, and in the ash of that coal, are two different things. It is not the fusibility of the coal that is under discussion, but the fusibility of the ash, and to give the sulphur in the coal and not in the ash destroys the value of the deductions made.

Causes of Clinkering

In one of the cases quoted, the oxide of iron in the ash was 6.1 per cent.; the coal carried 10 per cent. of ash and 0.61 per cent. sulphur, the fusing temperature of the ash being 2520 deg. In another case, the oxide of iron in the ash was 6.6 per cent.; this coal carried 9 per cent. of ash and 0.72 per cent. of sulphur, the fusing temperature being 2640 degrees.

The increase in the temperature of the fusing point may, according to this, be ascribed to an increase of 0.5 per cent. of oxide of iron, an increase of 0.11 per cent. in the sulphur content or the decrease of 1 per cent. of ash. Here are three factors to be considered, the oxide of iron in the ash, the ash itself and the sulphur in the coal. Nothing is said as to the sulphur in the ash or the other ingredients, in addition to the oxide of iron.

In another case, the ash contained 10 per cent. of oxide of iron, the coal 7 per cent. of ash with 0.7 per cent. of sulphur and the fusing point of the ash was 2880 deg. Compare this with the case in which the oxide of iron was 10.6 per cent., with 7 per cent. of ash as before, and 0.98 per cent. of sulphur in the coal, the fusing point of the ash being 2300 degrees.

According to this it would seem that an increase of 0.6 per cent. of oxide of iron lowers the fusing point of the ash 580 deg. as against an increase of 120 deg. in the preceding case; or that an increase of 0.28 per cent. of sulphur in the coal may have been responsible for this increase in the fusing temperature.

Effects of Sulphur

When we speak of the effect of sulphur on the fusing point of ash, without giving the amount of sulphur and other ingredients present, I do not see that we get much light on the subject. There is a certain proportion of the sulphur in coal that is removed during the process of combustion or coking and a certain amount that is left behind. The ratio between these amounts varies a good deal and can hardly be stated in the form of a rule. It has an important bearing on clinkering and coking.

I looked into this matter several years ago in some detail and published the results of this investigation in my "Iron Making in Alabama," 2d edition, 1898, page 99. It was there shown that the decrease of sulphur, from coal to coke, was about 30 per cent., for that particular coal. The coal itself showed 1.91 per cent. of sulphur and the coke made from it in a beehive oven gave the following results:

	Sulphur
48-hour coke	1.37
72-hour coke	1.31
96-hour coke	1.34

It may, however, be urged that the amount of sulphur remaining in coke is quite a different thing from the amount remaining in the ash of the coal; this, of course, is true, but the point is that unless we know just what this proportion is we are working in the dark.

It makes no material difference whether the sulphur originally present in the coal exists there as "organic" sulphur, as pyrite, or gypsum, insofar as concerns the inability to get rid of it, in coke or in ashes. The really important point is: What proportion of it is removed on burning or coking and what remains? In coke, the portion that remains has to be slagged off while in ashes it may influence clinkering to a marked degree through the fusibility or infusibility of the compounds into which it enters.

The following is an analysis of a coal which had 2.54 per cent. of sulphur and an ash content of 15.33 per cent.:

Silica	29.14
Alumina	15.56
Lime	20.73
Magnesia	1.91
Oxide of iron	13.42
Sulphur	6.00

The sulphur was probably combined with lime, as gypsum, and the amount of gypsum in the ash was probably as much as 25.5 per cent., or one-fourth of the weight.

This is a high ash and a high sulphur coal. The oxide of iron is within 0.48 per cent. of that in an ash, which, according to the table given by Mr. Wadleigh, fused at 2190 deg. On the other hand, the oxide of iron is within 0.42 per cent. of that of an ash which fused at 2520 deg. No fusing point determinations were made on this ash, but the coal has not given any serious clinkering troubles under stationary or locomotive boilers.

Necessity of Ash Analysis

In concluding this article, already too long, I wish to say that unless we have the sulphur in the coal, the ash of the coal and the complete analysis of the ash, determinations of the fusing point of the ash are of little value.

Also I believe there should be an entire overhauling of the specifications under which coal and coke are sold. The composition of the ash and the fusing point are just as important as the moisture, volatile combustible matter, fixed carbon, ash, sulphur and the heat units. I believe that as concerns clinkering, the composition of the ash is of more importance than the amount, but current specifications do not take this into consideration. Even the sulphur-ash-heat-unit basis is apt to be misleading unless we have the composition of the ash and its fusing point. In dealing with such a complex substance as coal, used as it is under such diverse conditions, we need all of the light possible. It would be entirely feasible to adopt some standard with respect to the fusing point, either the well known Seger cones or the more accurate thermo-electric pyrometer. An agreement could also be reached with respect to the size and shape of the test pieces and how they should be made up.

We multiply coal analyses until they have become a burden, but we are neglecting some of the most important things in connection with the practical economies in the use of coal. We have just about enough coal analyses; now let us see if we cannot get a series of coal ash analyses, with the fusing points.

Mr. Wadleigh's Reply to Mr. Phillips

I was glad to note the criticisms by the Director of the Bureau of Economic Geology and Technology, University of Texas, on the article on *Impurities in Coal* and appreciate the spirit in which the criticisms were made, while not altogether agreeing with them.

First as regards the definition of oxygen as an impurity: The Director states that what is essential in a coal cannot be considered an impurity and that analyses of coal that show no oxygen are so rare that he cannot recall a single instance. The latter statement is quite true, of course; there is no coal without oxygen, nor is there any coal (except Mr. Bements "pure coal") without ash, including silica, alumina, iron, etc. Yet the ash is surely an impurity.

Perhaps it would have been more accurate to have said, in the words of Dr. David White, that "With respect to their efficiency, as fuels, oxygen is an original impurity in coals." Dr. White also uses the words "Anticalorific values of these two great impurities in coal," speaking of oxygen and ash.

As coal is always considered with regard to its efficiency as a fuel, I still think that oxygen may be classed as an impurity. The Director is referred to Dr. White's valuable paper "The Effect of Oxygen on Coal," Bulletin 362 U. S. Geological Survey, for further data on the subject.

Second, regarding clinkering of coal and its cause. The object of the determinations of the fusing temperature of the ash, as given in the table referred to, was to find out the comparative liability to clinkering of the coals tested; the percentage of sulphur in the coal was given so as to show that there was no relation between the amount of sulphur and the ash fusing temperature. Chemical analysis of the ash does not enter into the point at all; what we want to know is whether the percentage of sulphur in the coal has anything to do with the tendency to clinker or the comparative fusing temperature of the ash.

The whole gist of the matter is that no analysis of a coal will give any idea as to its clinkering nor can any chemist determine accurately from an analysis of

the ash at what temperature it will fuse, whereas the actual determination of the fusing point by Seger Cones *will* give this information (fusing temperature of ash). The probabilities are that no one substance causes clinkering but that the fusing point is raised or lowered by varying mixtures of the different ingredients in the coal and its ash.

The Director states that, unless we have the sulphur in the coal, the ash of the coal and the complete analysis of the ash, determinations of the fusing point of the ash are of little value. To this statement I must take direct issue. Determinations of the fusing point of the ash of a coal are of the greatest value even if we have no other data whatever, as this information tells us directly under what furnace conditions the coal will clinker, a most important point to the user. On the other hand, the yield of sulphur in the coal and the analysis of the ash are of no value whatever, as regards the use of the coal as fuel under boilers.

Full and complete ash analyses will probably show us why ash fuses at different temperatures, but they will not at present give the consumer any data as to how a given coal will act under his boilers, while the actual determination of the fusing temperature does give such data in a concrete and usable form.

As regards specifications for the purchase of coal, the Director is entirely right in saying that they need overhauling; they should be simplified in one respect and amplified in another. Simplified as regards the analysis and heat value requirements and amplified as regards the liability of the coal to clinker and also as regards taking samples.

Specifications should cover only moisture, ash, heat value and ash fusing temperature (volatile only where smoke is considered), but they should give in detail the exact method of taking samples and their preparation for the laboratory and *in the laboratory.*

The writer desires to thank the Director for his courteous and kindly comments on the original article under discussion.

Cooling off Boring Tools

In cooling off boring tools, if water is employed, the tool should be moved up and down to prevent the formation of a line of fracture. Coal tar is suggested as being superior to water for cooling off tools. It is a poor conductor of heat, there is not the same liability to form a line of fracture and, being rich in carbon, it restores to the steel that which has been lost in heating.

In mines where the roof is poor and shooting from the solid is permitted, the introduction of mining machines would be of great benefit, as they would eliminate heavy shots, which disturb the roof.

Gayton Mine Explosion

The Gayton mine is a slope working, the coal pitching at from 25 to 30 deg. It extends about 2000 ft. from the surface and has been in operation for a great number of years. The workings are now well below sea level. The opening is situated in the town of Henrico near the city of Richmond, Va.

The operating company is the Old Dominion Development Company, J. M. Fitzgerald of New York City being the president. About 90 men were at work at the time of the explosion but as most of them were a long way from the seat of its violence they escaped unharmed.

The explosion which occurred July 17 was quite violent but limited in its scope. The men who received the full force of the blast were mutilated so severely that they could hardly be recognized. Some were killed apparently by the afterdamp. There were nine men in the workings affected, of these six were killed and three were severely injured.

Careless Shot Firer

It appears that the mine is gaseous, and gas was discovered in the slope by George Lewis the fireboss when making his morning rounds. He did not think it enough to cause alarm, however.

William Donnelly, the survivors assert, charged a hole with dynamite in a place which he knew was dangerously full of gas. He lighted the fuse and two explosions followed, one of which is believed to have been from the dynamite and the other from the gas in the mine. Wm. Donnelly is said to have remarked that "this is a dangerous shot but I'm going to risk it."

Mine with Bad Record

There was an explosion in Gayton mine (Jan. 1909) when six men were killed and several others injured: This was ascribed to dust. Four men were killed last winter in an explosion when a charge of dynamite was set off. No less than 14 men have been killed in this mine during the present year and almost as many more have been injured.

The coroner's jury found that the explosion was caused by the carelessness of Wm. Donnelly in setting off a charge of dynamite, when he was aware of the presence of gas; that because of the numerous fatal accidents, the state officials should make a prompt and thorough investigation into the methods of ventilation, and gas detection; that the state law authorizing the employment of a state inspector of mines ought to be made effective, that since the passage of the law, the Gayton mines have not been inspected by any state official, and that the victims met their deaths by asphyxiation due to the combustion of gas in the mine when William Donnelly fired a charge of dynamite.

Rescue Work Assisted by Telephone

As the explosion occurred about 2000 ft. from the surface, its effect was not apparent to the men outside. One of the injured men crawled to the telephone and notified the tipple force. Superintendent A. G. McGowan led a party to within about 50 ft. of the place where the victims were lying but was overcome with several other rescuers and had to be dragged out. The damage was not severe and the finding of the bodies was later accomplished without difficulty. The dead men are William Donnelly, shot firer; Geo. Bolisch a Pole, driver; Henry Billups, colored, miner; Norman Cade, miner; Matthew Butts, colored, brattice man, and Silas Williams, colored, miner.

Mine Haulage

W. C. Mountain recently read a paper on "Electric Haulage in Mines" before a British mining society. He showed that with main-and-tail rope haulage, 600 tons could be hauled a distance of a mile in 10 hrs. with an engine generating 280 hp. But when the endless rope system is installed, the horsepower can be reduced to 75, for in the main-and-tail rope system, as is well understood, the load consists of the combined weight of the ropes, cars and coal. On the other hand with the endless rope, the net weight of the coal only has to be moved, the rope and the cars practically balancing.

At a colliery producing 4000 tons per day and with a haulage exemplifying the main-and-tail rope system, 20 men were required in the car shop to keep the wagons in repair. In another mine which produced 3000 tons per day, where the haulage was by endless rope, only 5 men were needed for car repairs. The life of a rope was shown to be only one year working on the main-and-tail rope system, but it would last three and a half years when used as an endless rope. Mr. Mountain advocated the use of compressed air machines where gas was present and suggested placing compressers as near as possible to the haulage point and driving them by electric motors.

Our Front Cover This Week

The picture on the cover of this issue shows a Sullivan machine of the chain cutter-bar pattern of the special variety, known as a "continuous cutting" machine. This cutter is sumped at one wall or rib of the room, or entry, and travels across the face on a feed chain, being driven by sprockets and feed gearing with friction clutch escapement. The kerf is 6 in. high, and the cut 6½ ft. deep. The picture was taken in the mines of the Lumaghi Coal Co. at Collinsville, Illinois. The coal is of medium hardness and is from 7 ft. to 8 ft. in height. The seam is practically flat.

Colliery Mine Car Construction

Special Correspondence

This is the second article dealing with the design and construction of mine cars. The discussion here is confined entirely to the subject of running gear. Notes on methods for determining frictional resistance are given, and there is also a detailed description of a number of the patented car wheels.

The problems facing the wheel manufacturers are the provision of a bearing having a minimum of friction, maximum of wear and a suitable oiling arrangement; the tread should also have good wearing qualities and the whole wheel must be as light as consistent with the hard usage to which it will be subjected. Almost innumerable designs of wheels have appeared on the market in the past decade, varying principally in the bearing and methods of oiling.

Frictional Resistance

Manufacturers of mine locomotives have for a number of years assumed a resistance of 30 to 40 lb. per short ton regardless of the size and weight of the car or type of bearings with which it was equipped. These figures are fairly accurate for the old style mine car, but on those equipped with any of the modern bearings this resistance is greatly reduced. To enable a comparison of the results obtained with different types of wheels it is necessary to have some method of measuring the frictional resistance.

This may be arrived at approximately by methods of comparison. Thus, the speed and ease with which a car moves over a certain known grade, as for instance, a parting at a shaft bottom, may be observed and the results compared with the rate of moving on other tracks. A rough approximate estimate of the actual frictional resistance in pounds may also be arrived at by this means when it is remembered that 1 per cent. of grade is equivalent to a force of 20 lb. per short ton.

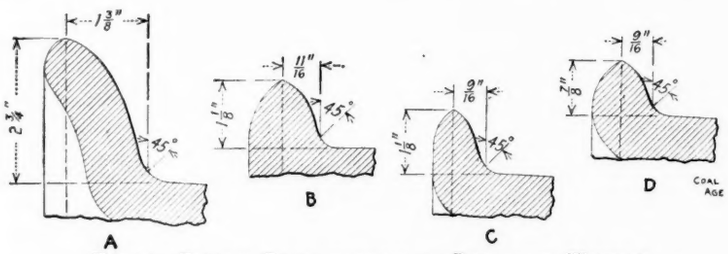
This rule is, at the best, only a rough approximation and is applicable only to loaded cars. Since a great deal depends upon the condition of the tracks, there is the possibility of another large error occurring due to this. As the reverse of this it might be noted here that some mine foremen estimate the grade of a piece of track by the way in which the car runs. One rule, quite popular for use in this way, is, when the car requires one sprag to hold it to a reasonable speed, the grade is 1 per cent., two sprags, 2 per cent., and so on.

If a dynamometer or a small spring balance with a capacity of 100 lb. is available, the resistance may be obtained quite accurately by pulling the cars slowly and steadily along the track. When using this means it is best to pull the car on a slightly ascending grade in order to insure a constant reading on the balance.

Wheel Flanges

The flange of the wheel plays an important part in keeping the car on the track and in the accompanying illustration, are shown a number of the various types of flanges, which are the standards adopted by the Sanford-Day Iron Works.

The type shown at *A* is the form commonly applied to lumber trucks. For usages of this kind an excessively high flange is required in order to insure the cars keeping the tracks, which are of the cheap construction, often being laid with lumber rails.



Typical Flange Cross-sections of Different Wheels

For the larger-sized wheels, from 20 to 30 in. in diameter, the form shown in *B* is used. This is quite similar to the *C* type, although of somewhat heavier cross-section.

The type shown at *C* is the standard form used on the ordinary 18-in. mine wheels. It has a somewhat high, slim cross-section and gives excellent results on the average mine track.

The type shown at *D* is the standard design used on wheels of from 10 to 16 in. in diameter. It will be noted that this has a shorter and thicker cross-section than that shown at *C*.

Watt Wheels

The Watt, Model D wheel is an effort to overcome the objections to the various loose cap, solid cap and capless wheels. It is rendered dust proof by using the solid cap construction and the journal box with the waste-packed joint. The grooved-axle method of fastening is used, but the groove is moved forward far enough to reduce the strain on the outer end and prevent the breaking of the axle at the groove. Two fastening bolts are used instead of one, so that should one break the other will hold the wheel and the broken one, dropping out, will be seen and replaced before serious damage is done.

The oil valve is so designed that no part of it will obstruct the flow of oil from the can or force gun. The felt packing is only used when oil is the lubricant; when semi-fluid grease is used the felt should be omitted. The bearing surface is at least 1 in. longer than cap or capless wheels of the same over-all dimensions. The oil chambers are large, yet well braced under the base of each spoke. The treads and flanges are well designed to stand up under heavy service and are deeply and uniformly chilled.

The Watt roller bearing wheel is made in three types, with the bearings in the wheel and a removable cap, with bearings in the wheel and a solid cap, and with bearings in the axle box. Wherever this last construction can be used it is to be preferred, owing to its freedom from end pinch on the rollers.

The type with loose cap and rollers in the wheel has been the most popular for the reason that it can be readily adapted to cars already built. It is rendered oil tight and dust proof by a felt-packed journal box inclosing the rear end of the hub, which is carefully machined. The removable cap in front serves to place the washer and cotter in position and to pack the wheel with a good semi-fluid grease, which is always preferable to oil. The oil valve through the cap serves to add a small quantity of good oil from time to time to keep the grease in good condition. The spaces in and around the rollers make a reservoir for oil.

The wheel is not subject to wear except on the tread and flange, because the rollers run in a steel sleeve, which can be renewed from time to time if necessary, and the back end is protected by a steel washer likewise replaceable. The tread and flange are deeply and uniformly chilled, and will resist wear for a long time. The roller bearings themselves will reduce the coefficient of friction to about 30% of what it is with ordinary wheels. The actual reduction of drawbar pull, of course, is dependent on the amount of grade against the load. The total drawbar pull will be the per

cent. of grade plus the coefficient of friction. Even with bad grades, however, the reduction will be very noticeable.

Hockensmith-Hyatt Roller Bearing Wheels

The combination of the Hockensmith wheel and the Hyatt flexible roller bushing is new as compared with the wheel itself. In laying out this design, incorporating the flexible roller bushing, it was attempted in the first place to have the bushing properly located in the hub, which is of sufficient length to warrant the bearing being able to carry the load and withstand the thrust of the wheels when going around sharp curves without serious injury to the axle, which is of the floating type.

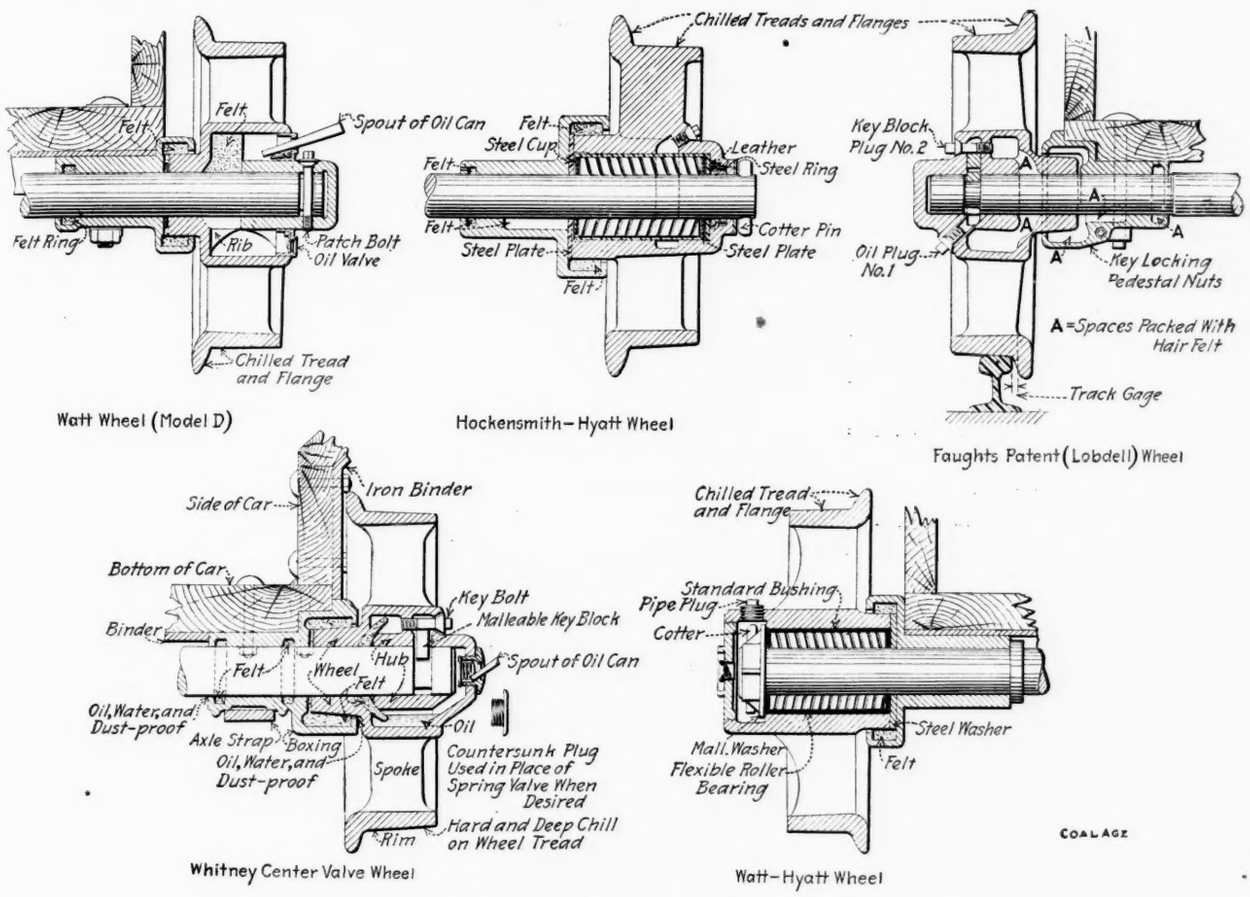
The most serious difficulty with the floating type of axle is that after the cars have been in operation for some time the axles cease to float for the reason that the boxes holding them are twisted out of alignment, cramping the axles and preventing them from turning under any pressure that may be brought to bear. With the Hockensmith angle-bar truck construction it is impossible to dislocate a housing in such a way as to cramp the axle and thereby nullify the floating effect, which is so essential.

Referring to the illustration, it will be seen that there is a comparatively small oil chamber in the hub of this wheel. This is designed to enable the oil to freely reach the bushing. The bushing itself, having hollow rollers, is an oil chamber and will carry sufficient oil to keep the wheel properly lubricated for a considerable period. Experience has shown that every two to three months is about the right period for oiling.

After once the oil is put into a wheel of this kind the question is to keep it there where it will do its work. In order to accomplish this purpose, the Hockensmith people have fitted the front end of their wheel with a cup leather, which is held on the axle by a spring-steel ring. In front of the cup leather is a steel washer which it works against, this washer being driven into the hub of the wheel. The wheel is held on with another loose steel washer on the outside together with a cotter pin. With this combination the oil cannot possibly leak out at the front end; in fact, wheels that have been in operation for a long time have shown so little leakage that the end of the axle was more or less rusty around the cotter pin.

At the back end of the hub the bushing is housed in by means of a steel cup washer, which shuts over the steel lining of the roller bearing itself and forms a complete pocket in which the rollers and the oil may operate. The outside of the hub is machined and the housing reaches over this hub with a large cavity in which felt is packed to prevent the oil working out in that direction. Between the housing and the hub of the wheel is a large, flat, loose steel washer, which prevents the hub of the wheel wearing into the housing and cutting the same off as has happened in some cases where this washer was omitted.

The housing itself is supplied with a large felt pad on the underside, which lubricates the axle sufficiently for such revolving as it has to do, and at the extreme end of the housing is still a further ring of felt to prevent dust and dirt working in at that end.



Cross-sections of a Number of the Modern Patented Wheels

Faught Patent Wheels

One of the principal features of the Faught patent wheel is the fact that the bearing is of extremely generous length and is properly placed in relation to the gage line of the wheel. The wheel is held in position on the axle by a key block as clearly shown in the accompanying cut and this is located at a point where it is at all times well lubricated, which is obviously a great advantage. This key block is held securely in its position by a taper head bolt, which can be very

easily removed, and by simply rolling the wheel so that the block is on the lower side it falls down and the wheel may be easily pulled off the axle.

Oil is applied to the hub through a hole which is stopped with a similar taper head plug on the opposite side of the hub, and this hole comes out in the groove where the key block runs, so that lubrication is absolutely certain at this point. In addition, there is a large oil chamber in the hub of the wheel, which will carry probably a half pint or more of oil at a time. This oil chamber is supplied with a packing of hair felt at the point marked *A* in the illustration. This prevents the oil from getting out too rapidly, and at the same time insures the axle being well oiled at all times.

The front end of the wheel is obviously closed, being cast solid, so that no oil can leak, and at the back end the hub is overhung by a generous pedestal, which is likewise packed with hair felt, preventing the oil escaping to any appreciable degree in this direction. The axles are round and free to turn in the housing if necessary, and in this way the wearing surface on that part of the axle inside of the wheel is changed at times and distributed about the entire circumference of the axle instead of being confined to one section, which would naturally wear away much faster than would the whole surface.

Whitney Wheels

The Whitney wheel here illustrated is what is known as the Whitney, center oiling, closed solid hub, self-oiling wheel. It is known as a solid hub wheel in contradistinction to the Whitney roller bearing wheel.

This wheel is a single, one-piece, chilled casting. It has a long, steady axle bearing averaging about 7 in. long. The center of pressure on the rail is over the center of the bearing. This feature of design prevents the bearing from cutting the axle, the wheel from tilting and the car from running wabbly. Nothing is quite so important in a coal mine as a smooth running, steady mine car.

The bearing is entirely protected from grit. The front end is closed tight and the rear end goes in a boxing packed with compressed hair felt. Two additional rings of felt, surrounding the axle, prevent the dirt from working in from the rear end. These felt packing rings also retain the oil, and it is no unusual thing for this type of wheel to run 60 days with one oiling. The bearing is thus grit proof, practically water-tight, and is also oil-tight. Water is kept out and oil is kept in.

The wheel is held on the axle by the well known malleable, key-block construction. The key block works in a groove turned in the end of the axle; this key resists only the slight outward tendency of the wheel. The inward thrust of the wheel is taken by the end of the axle against lugs cast inside the outer wheel hub and by the inside hub of the wheel against the pedestal box. Of course, as everyone knows, the inner thrust of the wheel going around curves is the most severe.

Oiling Arrangements

The center spring-valve oiler is the principal feature of this wheel. Oil passages lead from the central point of the wheel hub to the larger reservoir around the body of the wheel; the wheel can thus be oiled in any position. In other words, wherever the car stops the wheel can be instantly oiled. Furthermore, the wheel cannot be over-oiled, for it is impossible to run it in to a level higher than the bottom of the axle.

The spring-valve cage does not have to be oiltight. A speck of dirt will make any valve leak. In this construction, the oil never overflows the spring valve, and therefore the only function of the valve is to keep the oil from getting out of the bearings and prevent the dirt from working in. In this respect, this is a practical arrangement. The spring valve is a large, malleable-iron affair that cannot be damaged, and there is plenty of room for the spout of the oil can. The wheel can be oiled quickly and there are no bolts to be left out and lost. In other words, this is a fool-proof construction, and in this respect is a great improvement over the old-style side-oiling Whitney wheel.

The treads of these wheels are chilled to a depth of more than 50 per cent. of the thickness of the tread, which gives a wheel that will last almost indefinitely. There is a combination here of a strong, well chilled, annealed wheel with a dirt-proof, well lubricated, steady running bearing.

To find the safe load for a pit rope, square the circumference in inches, divide by three and the result will be the safe load in tons.

Midland Mine of the Rocky Mountain Fuel Co.

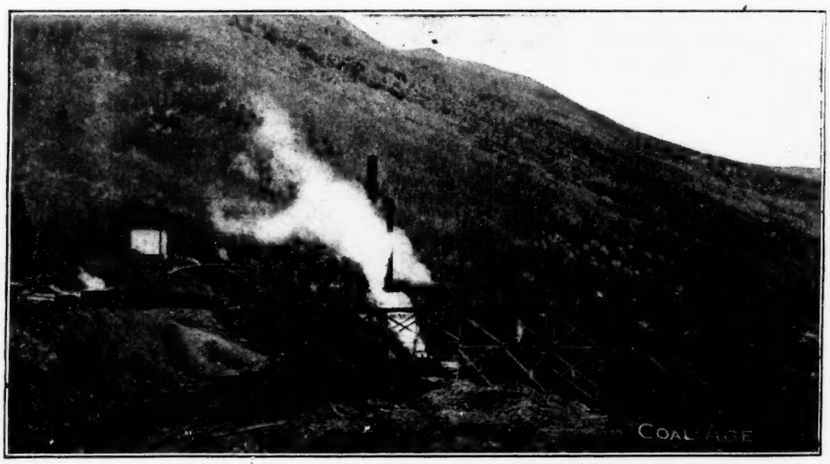
By Benedict Shubart*

In these days of elaborate mining equipment, it is a pleasure to visit a mine where efficient operation and economy are combined with perfect simplicity.

The Midland mine of the Rocky Mountain Fuel Co. is situated at Sunlight, Colo., on a spur of the Colorado Midland Railroad about nine miles from Cardiff. It lies in a beautiful protected valley, at an elevation of 8100 ft., just an easy drive from the famous summer resort of Glenwood Springs.

System of Mining

Practically the entire product of 400 tons per day is taken by the Colorado Midland Railroad and the Arkansas Valley Smelter of the American Smelting & Refining Co. at Leadville. The mine is opened up by a drift, running 500 ft. level then dipping 10 deg. for a short distance and 20 deg. for the balance, intercepting the two seams which are being mined. These are each 10 ft. in thickness and lie 60 ft. apart. The dip of coal is 42 deg. toward the west. The side entries are driven on a water level grade, and all rooms up the pitch, none being driven from the back entry.



General View of the Midland Mine of the Rocky Mountain Fuel Co.

The mine is opened on the room-and-pillar system, rooms being driven 20 ft. wide with 20-ft. pillars. The coal is very soft and friable and yields only 20 per cent. lump, which is quite small at that. However, it is exceedingly clean, of a high grade, and there is no difficulty in disposing of the entire product.

The floor and roof are of shale, and are very poor; heavy timbering is necessary at all times. On account of the heavy pitch, chutes are used in the rooms. A short switch is turned off at the room neck, and the pit cars are loaded practically without leaving the entry.

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*Boston Building, Denver, Colo.

Surface Plant

The mine cars are built on the ground by the company. The track gage is 36 in. and the Watt Style "C" trucks with 16-in. wheels are used. The cars weigh approximately 1800 lb. and hold 2200 lb. of coal. Haulage is accomplished by the tail-rope system, the trips consisting of six cars.

The tipple consists of the usual wooden structure with gravity screens making lump and slack only. The tipple grades have been very carefully laid out and the mine car used has such even running qualities that practically no hand labor is needed, the cars run perfectly into the goose-neck dump and back to the hoisting rope.

As before stated the entire plant and mine is laid out very simply. The boiler plant consists of a 150-hp. Lyons boiler carrying 150 lb. steam pressure. An old 60-hp. boiler is now used for preheating the feed water before it is pumped into the Lyons boiler, thus adding greatly to the steaming capacity of the larger boiler.

This boiler plant furnishes steam to the fan, hoist and turbo-generator. The ventilation is handled by a 5-ft. engine-driven Sirocco fan. The hoist is an 18x-36-in. first-motion, 72-in. double-drum, tail-rope hoist, built by the Vulcan Iron Works of Denver. A 35-kw., 250-volt, direct-current, Kerr turbo-generator furnishes power for electric lights and for driving the mine pumps.

The entire equipment of this mine is a model of simplicity and economy and it is said that, from the standpoint of profits, it is one of the best of the central Colorado mines.

The Miners' International Congress

The International Congress of Miners met at Amsterdam, Holland, on July 8, with E. Edwards, an English member of Parliament, as president. The following are the subjects discussed with the countries from which the suggestions emanated:

The Congress discusses the five-day week and shortened hours per day. Old age pensions are to be granted miners at fifty. Inspectors are to be elected by miners and paid by State. Nationalization of mines is advocated and also a restriction in the output of coal and a minimum wage for all kinds of workers.

Workmen Inspectors

1. This congress is of the opinion that the greatest possible safety to miners can only be procured by mine inspectors elected by the workmen and paid by the same. These workmen's officials must have the right to inspect the mines as often as they desire or the workmen demand it.—Holland.

Nationalization of Mines

2. That the congress discuss the taking back of the mines by the state, and their working by the latter for the benefit of the community.—Belgium.

2a. That this congress is of opinion that all land, mines and railways should be nationalized in the interests of the industries of the different countries.—Great Britain.

2b. Mining concessions must not be granted to private persons. The interests of the community demand that the mines should be worked for the benefit of the whole nation, and that the interests of the workers, the indispensable producers, should be seriously safeguarded.—France.

Five Days Work Per Week

3. That this congress is in favor of a uniform working policy of not more than five days per week at all collieries in the districts represented at this congress. That this question be relegated to the International Committee to formulate a scheme and fix upon a date when in their judgment the five days per week should commence. That the committee prepare a report, printed copies to be sent to all districts. That the congress to be held in 1913 decide finally upon the date when a working week of five days shall commence.—Great Britain.

Regulation of Wages

4. We are of the opinion that the law should intervene to sanction the principle of a minimum wage, the rate of which to be fixed between the workers' unions and the employers.—France.

4a. We are of the opinion that a law should be passed fixing the principle of a minimum wage, and that the rate of wages should be fixed by negotiations between the unions and the employers.—Holland.

Hours of Labor

5. That the congress discuss the eight-hour day and the regulation of the hours of work as existing in the various countries affiliated.—Belgium.

5a. We are of the opinion that the time has come to hasten the introduction of the eight-hour day from bank to bank for all mine workers employed underground or at the surface, with a maximum working week of 48 hours for every workman.—France.

International Strike

6. That the congress examine the practical means and measures to be taken with respect to the possible organization of an international strike.—Belgium.

7. We are of the opinion that in the case of a general strike taking place in any country, the Miners' Federations of the neighboring countries should limit their production by a resolute stoppage of work.—France.

Housing and Eviction

8. That this congress desires to express its indignation at the conditions under which the miners in many colliery districts are at present living because of the miserable housing accommodation which is provided for them, and we call upon the various governments to promote housing legislation which will make the present state of affairs impossible; and, further, we ask for legislation to prevent the eviction of the workers' families from their homes during an industrial dispute.—Great Britain.

Pensions

9. The International Miners' Congress avers that the invalidity and premature old age of the mining population are a consequence of their occupation, and is of the opinion that the miners have therefore a right to invalidity and old-age pensions. The congress instructs the national organizations to apply to their respective governments with a view of obtaining a legal settlement of this question.—Holland.

9a. We are of the opinion that a minimum pension of 2 francs (1s. 8d.) ($0.40) per day should be paid to the mine workers after 25 years of service and at 50 years of age; that in case of invalidism, and also in case of a man leaving work in the mining industry, this should be proportional to the number of years worked; that in case of death, half of it should revert to the widow or to the orphans.—France.

Insurance

10. The congress is in favor of a system of general insurance at the cost of the coal owners, which will secure the miners benefits in the following cases: (a) Sickness, (b) accident, (c) premature old age; the minimum benefit attaining at least 75 per cent. of the daily wage.—Belgium.

Congress Every Two Years

11. We move that the International Miners' Congress take place every two years. If important events occur by which the whole mining population of a country represented in the Interna-

tional Committee is affected, the International Committee may call an extraordinary congress.—Holland, Austria, Germany, France.

Resolutions passed by International Committee to be discussed at the congress:

1. That the regulation of the output of coal be discussed at the next congress, and that Tuesday afternoon of the congress week be allotted to this question.

2. That the question of a national clearance card to be used by the various nationalities within the International Federation be agreed upon at the congress to be held in Amsterdam. That the International Committee meet during the week of congress and draft and agree upon the form and text of the clearance card to put before the congress for its adoption.

The Cadeby Explosion

Few explosions have been more remarkable than the recent one at Cadeby, Yorkshire, Eng. Though it is impossible to give a full or accurate account at this early date, a short summary may be of interest. Many mines have exploded twice, successively, and the second explosion is usually supposed to have resulted from the hot embers from the first inflammation setting fire to new accumulations of firedamp.

In this case, the length of time was too great for such a cause and it is more likely that the repeated gusts of flame and bursts of violence were due either to the probable cause of the first explosion, a spontaneous gob fire or to a conflagration started in the coal by the explosion itself. It may be added that a gob fire was believed to have manifested itself in the mine shortly before the catastrophe.

Spontaneous Ignition Causes Explosion

The Denaby and Cadeby Collieries are among the best regulated mine works in England. They have been troubled with spontaneous combustion, but hitherto there have been no fatal results. In the section of the mine where the explosion took place, no electric machines were in use and no shooting was customary in any part of the mine. Consequently the explosion was almost certainly due to the heating and firing of the gob.

Conisborough, the town adjacent to Cadeby mine, lies 4 miles southeast of Doncaster. It is in the deep part of the Yorkshire field. How far the beds extend at workable depths is not known, but at Cadeby where the celebrated Barnsley bed was being worked the coal was at a depth of about 2400 ft.

The two mines, Denaby and Cadeby Main collieries, of the company of that name, employed over 5000 men. The southern district of the Cadeby workings usually employed 136 men but the visit of the King and Queen to Elsecar colliery near-by had reduced the number working to about 37 on the morning of the catastrophe, July 9. The explosion which apparently killed all these men occurred early in the morning, about 4:30 a.m.

The First Rescue Party

Edward Humphries, a day man, appears to have been the first to notice that it had occurred. He felt a blast of wind in his face and saw dust whirling in the air. He went with a man named Joseph Farmer to make an investigation. Jack Bullock a roadman and George Fisher a deputy were sent for and they accompanied them on their dangerous mission.

In No. 14 level they found cars badly smashed, girders twisted and every evidence of a severe explosion. They proceeded into that level and though they met with much foul air, they succeeded in penetrating the workings and found the body of a man flung across the road half buried in dirt. From his attitude they could tell he had been hurled down by the force of the explosion. They recognized him as Martin Mulrooney, a day worker from Mexborough.

The Loss of 51 Rescuers

Humphries went to the shaft bottom for assistance and soon the rescue parties began to descend. The second explosion occurred at 5 o'clock and was more serious than the first being heard 2 miles away. The rescue work was not halted and by 11:30 a.m. 20 bodies were brought out. By this time no less than 4 inspectors were in the pit, W. H. Pickering, H. R. Hewitt, G. Y. Tickle as noted in our issue of the 13th, and also Senior Assistant Inspector, J. R. R. Wilson from Leeds. With these were Chas. Bury, manager of Cadeby shaft, Douglas Chambers manager of the Denaby workings, and Basil Pickering in charge of the Wath colliery.

A third explosion occurred, described as being a series of blasts followed by falls of roof. The rescuers were cut off and many were buried. As stated before, three of the mine inspectors were killed. Douglas Chambers was found dead, and Chas. Bury was removed in a precarious condition but is now progressing favorably. This explosion killed 51 men bringing the total up to 88.

But the work of rescue went on nevertheless. At midnight of that same terrible day a dozen men were still searching for bodies. There came a sudden puff of wind. All the men ran and had not proceeded far when the fourth explosion occurred. Only two men were injured and none seriously.

Safeguarding the Plant from Fire

The enormous annual property loss by fire throughout the country, certainly drives home the conviction that, no matter what may be the character of the plant, it is imperative that the most approved and uptodate system for fire protection be installed. Many plants are now equipped with automatic water-sprinkling systems, and their protection is assured as long as the water pressure is maintained.

A fire-pump motor with its control panel is manufactured by the General Electric Company, Schenectady, N. Y. All operating parts of the control panel, have bearings provided with noncorrosive parts so that they cannot rust on account of long disuse and prevent the motor operating at critical times. The complete panel is inclosed in a splash-proof case, which effectively protects it from dripping water, and also prevents a stream from fire hose from striking it.

A pressure governor is connected to the water-pressure system, and closes the control circuit of the panel as soon as the water presure falls to a predetermined value, starting the motor with all the starting resistance in circuit. Current limit contactors automatically accelerate the motor by cutting out successive steps of this resistance.

If desired, the motor may be started by means of an operating lever at the right of the contactor. This method forces the contactors to close in their proper sequence by means of a cam shaft. The panel is fully protected against failure of voltage and also from overloading. Two lamps are mounted on the panel, one serving to indicate when there is voltage on the line, while the other indicates to the operator that the motor is running. The lights are visible through glass bulls' eyes in the inclosing cover.

The contactors which open the main line circuit are provided with powerful magnetic blowouts, which snuff out the arc when the circuit is opened and prevent any burning of the contactor parts The carbon-break circuit breaker, used for overload protection has been designed especially for very severe service. All current carrying parts are of ample cross-section insuring continuous operation without overheating.

The iron grid starting resistance is of sufficient current carrying capacity for frequent starting of the motor. Such frequent starting might be required in case only one sprinkler head should open, as this would cause a small flow of water in the pipes and the pumps would be able to quickly refill the tank. At this point the control system stops the motor, only to start it again when the pressure falls to a value at which the pressure governor is adjusted to operate.

Accidents in Bituminous (Pa.) Mines

By Frederick L. Hoffman*

Tabulated statistics showing the number of employees and number of fatal and nonfatal accidents and the death rates, due to various causes, in the several mine inspection districts, in the bituminous region of Pennsylvania, for a period of five years, 1906-1910, inclusive. Comparisons are drawn between the death rates for the same class of accidents occurring in the bituminous and the anthracite districts of the state, with the result that the bituminous death rate is shown to be lower than the anthracite in every instance, except in respect to gas or dust explosions and accidents due to machinery and electricity.

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Supplementing my article on fatal and nonfatal accidents in the anthracite coal mines of Pennsylvania, COAL AGE, April 27, 1912, p. 940, I have prepared the following tables for the bituminous coal region of that state. In compiling these statistics a geographical division of the coal field was not deemed advisable. It would have been possible, however, to have presented the data in detail by counties, but it seemed best to give the returns by inspection districts. The tables are identical in their arrangement and afford a convenient means for a comparison of the facts for the bituminous and anthracite districts. It may be stated, however, at the outset, that the proportion of inside employees in the bituminous coal mines of Pennsylvania was 82.5 per cent. during the period under consideration (1906-1910), against 70.9 per cent. for the anthracite region. Since the proportion of inside employees is the determining factor in the general fatality rate, it is obvious that this element requires to be taken into account.

TABLE I. ACCIDENTS IN THE BITUMINOUS COAL MINES OF PENNSYLVANIA, 1906–1910

Year	No. of Employees	Fatal Accidents	Rate per 1000 Employes	Nonfatal Accidents	Rate per 1000 Employees
Inside Accidents					
1906	141,862	455	3.21	1,113	7.84
1907	150,371	766	5.09	1,144	7.61
1908	152,536	550	3.61	983	6.44
1909	152,424	475	3.12	1,074	7.05
1910	159,671	484	3.03	1,081	6.77
Total	756,864	2,730	3.61	5,395	7.13
Outside Accidents					
1906	31,066	22	0.71	47	1.51
1907	32,750	40	1.22	63	1.92
1908	29,304	22	0.75	43	1.47
1909	33,497	31	0.93	52	1.55
1910	33,817	55	1.63	61	1.80
Total	160,434	170	1.06	266	1.66
All Accidents, inside and outside					
1906	172,928	477	2.76	1,160	6.71
1907	183,121	806	4.40	1,207	6.59
1908	181,840	572	3.15	1,026	5.64
1909	185,921	506	2.72	1,126	6.06
1910	193,488	539	2.79	1,142	5.90
Total	917,298	2,900	3.16	5,661	6.17

Table I shows in a convenient form the fatal and nonfatal accidents in the bituminous coal field of Pennsylvania for each year from 1906 to 1910, inclusive. According to this comparison the inside fatality rate, for this period, was 3.61 per 1000, which compares very favorably with the rate of 4.74 for the northern and 3.92 for the middle and southern anthracite coal fields, for the same period. The nonfatal inside accident rate was 7.13 per 1000 for the bituminous coal field, against 8.17 for the northern and 7.88 for the middle and southern anthracite regions.

The outside fatality rate for bituminous coal mines was 1.06 per 1000 during the period under consideration, or considerably less than the corresponding rates of 1.78 for the northern and 1.93 for the middle and southern anthracite coal fields. The nonfatal outside accident rates were also much lower in the bituminous coal region, or 1.66 per 1000 against 4.28 for the northern and 3.75 for the middle and southern anthracite coal fields. Although this difference may be accounted for, in part, by the methods of reporting nonfatal accidents, it may be safely assumed that the actual risk of outside operations is greater in the anthracite than in the bituminous region.

Table II presents in detail the outside fatal accidents in the bituminous coal field of Pennsylvania due to the principal causes named in the table, for the period 1906-1910. The table is self-explanatory and requires no extended discussion. It is strictly comparable with the corresponding table for the anthracite coal mines published in COAL AGE, April 27, 1912, p. 940. The chief cause of outside fatalities at these mines has been due to movement of cars, giving a rate, for the period named, of 0.54 per 1000 persons employed above ground, followed by miscellaneous outside accidents with a fatality rate of 0.28 per

TABLE II. OUTSIDE FATAL ACCIDENTS IN THE BITUMINOUS COAL MINES OF PENNSYLVANIA, 1906–1910.

District	No. of Employees	By Cars		By Machinery		By Boiler Explosions		By Electricity		Suffocated in Chutes, etc.		Other Outside Accidents		Total Outside Accidents	
		No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed
1	6,213	5	0.80	1	0.16	...	....	...	....	1	0.16	5	0.80	12	1.93
2	14,177	7	0.49	3	0.21	...	....	...	....	2	0.14	2	0.14	14	0.99
3	3,948	1	0.25	...	....	...	....	...	....	..	....	2	0.50	3	0.76
4	7,070	2	0.28	...	....	...	....	...	....	..	....	1	0.14	3	0.42
5	17,401	3	0.17	2	0.11	...	....	4	0.23	..	....	6	0.34	15	0.86
6	6,949	3	0.43	...	....	...	....	1	0.14	..	....	3	0.43	7	1.00
7	5,093	3	0.59	1	0.20	...	....	...	....	..	....	6	1.18	10	1.96
8	3,507	1	0.29	1	0.29	...	....	...	....	..	....	...	....	2	0.57
9	15,511	3	0.19	1	0.06	...	....	...	....	..	....	...	....	4	0.26
10	5,845	1	0.17	...	....	1	0.17	...	....	..	....	3	0.51	5	0.86
11	17,788	9	0.51	...	....	...	....	1	0.06	1	0.06	1	0.06	12	0.67
12	8,716	5	0.57	1	0.11	...	....	1	0.11	..	....	...	....	7	0.80
13	5,479	4	0.73	1	0.18	...	....	...	....	..	....	2	0.37	7	1.27
14	4,615	5	1.08	2	0.43	...	....	...	....	..	....	...	....	7	1.52
15	4,863	1	0.21	...	....	...	....	...	....	..	....	...	....	1	0.21
16	15,484	11	0.71	5	0.32	...	....	...	....	..	....	13	0.83	29	1.87
17	4,785	6	1.25	1	0.21	...	....	1	0.21	..	....	...	....	8	1.67
18	2,993	1	0.34	...	....	...	....	...	....	..	....	...	....	1	0.34
19	4,591	5	1.09	2	0.44	...	....	...	....	..	....	...	....	7	1.52
20	3,512	8	2.28	1	0.29	...	....	...	....	..	....	1	0.29	10	2.85
21	1,894	2	1.06	1	0.53	3	1.58	...	....	..	....	...	....	6	3.17
Total.....	160,434	86	0.54	23	0.14	4	0.02	8	0.05	4	0.02	45	0.28	170	1.06

TABLE III. INSIDE FATAL ACCIDENTS IN THE BITUMINOUS COAL MINES OF PENNSYLVANIA, 1906–1910.

District	Employees	By Falls of Coal and Roof		By Mine Cars		By Explosions of Gas or Dust		Suffocated by Gas		By Explosions of Powder, etc.	
		No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed
1	40,052	121	3.02	40	1.00	197	4.92	..	....	2	0.05
2	33,909	147	4.34	28	0.83	1	0.03	..	....	..	....
3	29,111	28	0.96	3	0.10	..	....	..	....	1	0.03
4	39,190	57	1.45	6	0.15	..	....	..	....	..	....
5	27,947	66	2.36	23	0.82	1	0.04	..	....	..	....
6	49,368	101	2.05	41	0.83	27	0.55	1	0.02	1	0.02
7	46,793	72	1.54	27	0.58	2	0.04	..	....	1	0.02
8	34,763	16	0.46	6	0.17	..	....	..	....	..	....
9	28,786	77	2.67	28	0.97	..	....	..	....	1	0.03
10	43,342	51	1.18	19	0.44	22	0.51	3	0.07	2	0.05
11	28,218	65	2.30	22	0.78	..	....	..	....	..	....
12	46,889	70	1.49	18	0.38	12	0.26	1	0.02	1	0.02
13	40,157	94	2.34	25	0.62	2	0.05	..	....	1	0.02
14	37,444	61	1.63	20	0.53	..	....	..	....	..	....
15	46,884	59	1.26	9	0.19	..	....	..	....	3	0.06
16	36,684	94	2.56	48	1.31	2	0.05	..	....	..	....
17	42,707	104	2.44	23	0.54	..	....	..	....	..	....
18	29,934	24	0.80	3	0.10	..	....	..	....	..	....
19	31,662	74	2.34	23	0.73	239	7.55	3	0.09	..	....
20	27,476	48	1.75	24	0.87	5	0.18	..	....	1	0.04
21	15,548	42	2.70	15	0.96	..	....	..	....	..	....
Total.....	756,864	1,471	1.94	451	0.60	510	0.67	8	0.01	14	0.02

District	By Premature Blasts		By Falling into Shafts, etc.		Kicked by Mule		By Machinery		By Electricity		Other Inside Accidents		Total Inside Accidents	
	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed
1	2	0.05	8	0.20	..	....	1	0.02	13	0.32	..	....	384	9.59
2	3	0.09	3	0.09	1	0.03	1	0.03	5	0.15	5	0.15	194	5.72
3	1	0.03	1	0.03	..	....	1	0.03	1	0.03	3	0.10	39	1.34
4	2	0.05	1	0.03	..	....	..	....	6	0.15	2	0.05	74	1.89
5	1	0.04	2	0.07	..	....	..	....	4	0.14	2	0.07	99	3.54
6	2	0.04	..	....	..	....	3	0.06	11	0.22	2	0.04	189	3.83
7	1	0.02	1	0.02	1	0.02	3	0.06	11	0.24	3	0.06	122	2.61
8	..	....	..	....	..	....	2	0.06	3	0.09	..	....	27	0.78
9	1	0.03	3	0.10	..	....	1	0.03	2	0.07	2	0.07	115	3.99
10	1	0.02	7	0.16	..	....	..	....	2	0.05	1	0.02	108	2.49
11	..	....	1	0.04	..	....	..	....	1	0.04	1	0.04	90	3.19
12	2	0.04	..	....	..	....	..	....	13	0.28	4	0.09	121	2.58
13	..	....	1	0.02	..	....	3	0.07	7	0.17	1	0.02	134	3.34
14	2	0.05	3	0.08	..	....	2	0.05	5	0.13	2	0.05	95	2.54
15	1	0.02	..	....	..	....	1	0.02	1	0.02	2	0.04	76	1.62
16	7	0.19	11	0.30	1	0.03	2	0.05	7	0.19	5	0.14	177	4.82
17	1	0.02	2	0.05	..	....	2	0.05	8	0.19	2	0.05	142	3.32
18	..	....	..	....	..	....	..	....	1	0.03	1	0.03	29	0.97
19	2	0.06	2	0.06	..	....	2	0.06	6	0.19	1	0.03	352	11.12
20	1	0.04	5	0.18	..	....	..	....	8	0.29	5	0.18	97	3.53
21	2	0.13	..	....	..	....	..	....	7	0.45	..	....	66	4.24
Total.....	32	0.04	51	0.07	3	0.00	24	0.03	122	0.16	44	0.06	2,730	3.61

1000 employed. The total outside fatality rate due to all causes in bituminous mines was 1.06 per 1000 persons employed.

Table III shows in detail the facts regarding fatal inside accidents in the bituminous coal mines of Pennsylvania, for the same period, 1906-1910. This table, also, is self-explanatory and requires no discussion, further than to say that the principal cause of fatal accidents was falls of coal or roof. The fatality rate due to this cause was 1.94 per 1000 persons employed, which compares favorably with the corresponding rate of 2.13 for the anthracite coal field considered as a whole. Accidents due to mine cars caused a fatality rate of 0.60 per 1000 men employed, for the bituminous coal field, against 0.68 for the anthracite region. The fatality rate for explosions of gases and dust was, however, decidedly higher for the bituminous region, or 0.67 per 1000 employees, against 0.32 for anthracite mines. Explosions of powder, etc., caused a fatality rate of only 0.02 per 1000 employed, for the bituminous region, against 0.19 for the anthracite, and, in further contrast, the fatality rate for premature blasts was only 0.04 for the bituminous, against 0.50 for anthracite mines per 1000 men employed. Accidents due to electricity caused a fatality rate of 0.16 per 1000 persons employed, in bituminous coal mines, against only 0.02 in anthracite mines. The aggregate inside bituminous fatality rate, during the period under consideration, was 3.61 per 1000 men employed, against 4.41 for anthracite mines.

TABLE IV. OUTSIDE NON-FATAL ACCIDENTS IN THE BITUMINOUS COAL MINES OF PENNSYLVANIA, 1906–1910.

District	Employees	By Cars		By Machinery		Other Outside Accidents		Total Outside Accidents	
		No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed
1	6,213	5	0.80	1	0.16	6	0.97	12	1.93
2	14,177	4	0.28	1	0.07	5	0.35	10	0.70
3	3,948	14	3.55	1	0.25	13	3.29	28	7.09
4	7,070	16	2.26	2	0.28	6	0.85	24	3.39
5	17,401	5	0.29	1	0.06	5	0.29	11	0.63
6	6,949	9	1.30	1	0.1′	4	0.57	14	2.01
7	5,093	7	1.37	1	.20	2	0.39	10	1.96
8	3,507	1	0.29	..	....	1	0.29	2	0.57
9	15,511	5	0.32	1	0.06	3	0.19	9	0.58
10	5,845	10	1.71	..	....	6	1.03	16	2.74
11	17,788	8	0.45	1	0.06	1	0.06	10	0.56
12	8,716	13	1.49	..	....	7	0.80	20	2.29
13	5,479	8	1.46	..	....	8	1.46	16	2.92
14	4,615	2	0.43	..	....	1	0.22	3	0.65
15	4,863	10	2.06	1	0.21	2	0.41	13	2.67
16	15,484	1	0.06	..	....	5	0.32	6	0.38
17	4,785	9	1.88	1	0.21	7	1.46	17	3.55
18	2,993	11	3.68	..	....	4	1.34	15	5.01
19	4,591	9	1.96	1	0.22	5	1.09	15	3.27
20	3,512	12	3.42	..	....	2	0.57	14	3.99
21	1,894	..	....	1	0.53	..	....	1	0.53
Total.....	160,434	159	0.99	14	0.09	93	0.58	266	1.66

TABLE V. INSIDE NON-FATAL ACCIDENTS IN THE BITUMINOUS COAL MINES OF PENNSYLVANIA, 1906–1910.

District	Employees	By Falls of Coal and and Roof		By Mine Cars		By Explosions of Gas or Dust		By Explosions of Powder etc.		By Premature Blasts	
		No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed
1	40,052	312	7.79	127	3.17	32	0.80	4	0.10	6	0.15
2	33,909	198	5.84	77	2.27	5	0.15	2	0.06	19	0.56
3	29,111	119	4.09	43	1.48	..	....	6	0.21	16	0.55
4	39,190	123	3.14	66	1.68	..	....	14	0.36	12	0.31
5	27,947	72	2.58	61	2.18	3	0.11	7	0.25	6	0.21
6	49,368	187	3.79	117	2.37	5	0.10	11	0.22	9	0.18
7	46,793	155	3.31	67	1.43	6	0.13	..	....	5	0.11
8	34,763	61	1.75	20	0.58	..	....	3	0.09	3	0.09
9	28,786	97	3.37	71	2.47	2	0.07	3	0.10	6	0.21
10	43,342	177	4.08	107	2.47	12	0.28	19	0.44	14	0.32
11	28,218	107	3.79	78	2.76	..	....	4	0.14	2	0.07
12	46,889	157	3.35	104	2.22	6	0.13	14	0.30	11	0.23
13	40,157	188	4.68	59	1.47	10	0.25	2	0.05	4	0.10
14	37,444	80	2.14	55	1.47	6	0.16	16	0.43	11	0.29
15	46,884	95	2.03	63	1.34	4	0.09	2	0.04	5	0.11
16	36,684	143	3.89	115	3.13	3	0.08	11	0.30	21	0.57
17	42,707	184	4.31	71	1.66	7	0.16	17	0.40	3	0.07
18	29,934	83	2.77	40	1.34	1	0.03	5	0.17	3	0.10
19	31,662	219	6.92	98	3.10	3	0.09	11	0.35	11	0.35
20	27,476	125	4.55	73	2.66	2	0.07	8	0.29	10	0.36
21	15,548	66	4.24	17	1.09	..	....	..	....	8	0.51
Total.....	756,864	2,948	3.90	1,529	2.02	107	0.14	159	0.21	185	0.24

District	Falling into Shafts, etc.		Kicked by Mule		By Machinery		By Electricity		Other Inside Accidents		Total Inside Accidents	
	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed	No.	Rate per 1000 Employed
1	..	....	5	0.12	9	0.22	..	....	50	1.25	545	13.61
2	..	....	3	0.09	4	0.12	1	0.03	14	0.41	323	9.53
3	..	....	1	0.03	6	0.21	..	....	10	0.34	201	6.90
4	..	....	2	0.05	2	0.05	1	0.03	7	0.18	227	5.79
5	..	....	1	0.04	..	....	..	....	8	0.29	158	5.65
6	..	....	2	0.04	3	0.06	2	0.04	6	0.12	342	6.93
7	1	0.02	6	0.13	10	0.21	2	0.04	6	0.13	258	5.51
8	..	....	..	....	5	0.14	..	....	1	0.03	93	2.68
9	..	....	5	0.17	2	0.07	..	....	20	0.70	206	7.16
10	..	....	3	0.07	6	0.14	..	....	11	0.25	349	8.05
11	..	....	3	0.11	7	0.25	..	....	40	1.42	241	8.54
12	..	....	1	0.02	3	0.06	2	0.04	11	0.23	309	6.59
13	..	....	2	0.05	3	0.07	..	....	14	0.35	282	7.02
14	..	....	..	....	5	0.13	1	0.03	2	0.05	176	4.70
15	..	....	1	0.02	5	0.11	..	....	17	0.36	192	4.10
16	1	0.03	4	0.11	12	0.33	..	....	19	0.52	329	8.97
17	..	....	4	0.09	8	0.19	..	....	9	0.21	303	7.09
18	..	....	3	0.10	1	0.03	..	....	3	0.10	139	4.64
19	..	....	9	0.28	8	0.25	..	....	25	0.79	384	12.13
20	..	....	2	0.07	6	0.22	..	....	18	0.66	244	8.88
21	..	....	..	....	1	0.06	..	....	2	0.13	94	6.04
Total.....	2	0.00	57	0.08	106	0.14	9	0.01	293	0.39	5,395	7.13

Table IV exhibits the corresponding information for outside nonfatal accidents due to the causes named, for each inspection district in the bituminous coal field of Pennsylvania, and Table V has reference to inside nonfatal accidents, both tables being identical in arrangement with the tables previously published for the anthracite region.

For the purpose of convenient reference and comparison, Tables VI and VII give respectively the fatal and nonfatal accident rates for the twenty-one inspection districts of the bituminous coal field, for the five-year period ending 1910. The average fatality rate, for the bituminous coal field as a whole, was 3.16 per 1000, the rate having been highest (9.9) in the 19th inspection district and lowest (0.76) in the 8th, per 1000 men employed. The average nonfatal rate, for the bituminous coal field as a whole, was 6.17 per 1000, the rate having been highest (12.04) in the 1st inspection district and lowest (2.48) in the 8th, per 1000 men employed. It is safe, however, to assume that nonfatal accidents are not fully reported and that the numbers and rates have reference only to the most serious accidents of this class, which are the only ones reported by the mines.

The present comparison affords the only useful and impartial means of ascertaining the local incidence of fatal and nonfatal accidents, by inspection districts and principal causes, and the tables for both the bituminous and the anthracite coal fields should prove suggestive and of practical value to mine managers and mine inspectors.

TABLE VI. FATAL ACCIDENTS IN THE BITUMINOUS COAL MINES OF PENNSYLVANIA, BY INSPECTION DISTRICTS, 1906–1910

District	Employees	Fatal Accidents	Rate per 1000 Employees
1	46,265	396	8.56
2	48,086	208	4.33
3	33,059	42	1.27
4	46,260	77	1.66
5	45,348	114	2.51
6	56,317	196	3.48
7	51,886	132	2.54
8	38,270	29	0.76
9	44,297	119	2.69
10	49,187	113	2.30
11	46,006	102	2.22
12	55,605	128	2.30
13	45,636	141	3.09
14	42,059	102	2.43
15	51,747	77	1.49
16	52,168	206	3.95
17	47,492	150	3.16
18	32,927	30	0.91
19	36,253	359	9.90
20	30,988	107	3.45
21	17,442	72	4.13
Total.....	917,298	2,900	3.16

TABLE VII. NON-FATAL ACCIDENTS IN THE BITUMINOUS COAL MINES OF PENNSYLVANIA, BY INSPECTION DISTRICTS, 1906–1910

District	Employees	Non-Fatal Accidents	Rate per 1000 Employees
1	46,265	557	12.04
2	48,086	333	6.93
3	33,059	229	6.93
4	46,260	251	5.43
5	45,348	169	3.73
6	56,317	356	6.32
7	51,886	268	5.17
8	38,270	95	2.48
9	44,297	215	4.85
10	49,187	365	7.42
11	46,006	251	5.46
12	55,605	329	5.92
13	45,636	298	6.53
14	42,059	179	4.26
15	51,747	205	3.96
16	52,168	335	6.42
17	47,492	320	6.74
18	32,927	154	4.68
19	36,253	399	11.01
20	30,988	258	8.33
21	17,442	95	5.45
Total.....	917,298	5,661	6.17

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Increase of Heat in Bore Holes*

A writer in the Zeitschrift des Internazionalen Vereines der Bohr-Ingenieure und Bohrtechniker (Journal of the International Society of Prospectors and Drillers) states that Jacob Königsberger, Professor of Geophysics, in Freiberg, has made public the results of numerous accurate observations in boreholes. While the results of his observations hitherto had led to the empirical formula that the temperature of the earth increases about one degree F. for each 64 ft. of depth, Herr Königsberger has recently found that the increase of heat is not regular but in the vicinity of ore or coal deposits, the increase was much more rapid and for the reason that in such localities, heat is constantly liberated through certain chemical processes. In the neighborhood of coalfields, the temperature rose about one degree F. for each 47 to 54 ft. in depth.

Especially rapid is the temperature increase near to petroleum, the rate being about one degree F. for 14 to 20 ft. in depth. Professor Königsberger draws from his researches, the conclusion that such observations in borings afford an indication which may lead to the discovery of coal and petroleum. The suggestion, however, seems somewhat overdrawn and unpractical.

*Translated by E. P. Buffet, for Coal Age.

Refraction of Light in Firedamp

By O. H. Hahn

Discussion of an instrument used for detecting minute percentages of firedamp, and based on the difference in the refraction of light when methane is present.

In view of the many calamities caused by the explosion of firedamp in coal mines and the fact that there are as yet no testing lamps in existence which will reveal the presence of less than ½ per cent. of this insidious gas, it is to be hailed with satisfaction that by the application of optical principles it has become possible to construct an instrument that will indicate as little as the one-hundredth part of 1 per cent. of methane in a gas mixture, and in less time than by any other method. This instrument is an improved interferometer, and its operation is based on the difference of the factors of refraction of different gases.

The instrument, known as an "interferometer," was originally devised by Professor Haber, of Karlsruhe, and Doctor Löwe, physicist to the firm of Carl Zeiss, at Jena, Germany, and consists of the following parts:

1. A telescope with a cylindrical eyepiece and an achromatic object-lens provided with an adjustable shutter having two vertical slits.

2. A Jamin compensator consisting of two plane-parallel glass plates which are set at an acute angle to the telescope. One of these is immovable; the other one rests on a spindle connected with a lever which can be raised or lowered at the option of the operator by means of a micrometer screw, thus changing the angle of inclination, and consequently the thickness of the glass stratum through which a ray of light is to be transmitted.

3. An air chamber with two parallel brass tubes of square section soldered together with silver, and lying side by side. The one to the left is intended to be filled with atmospheric air for purposes of comparison, the other one with the gas to be tested. At each end the tubes are closed with plane-parallel glass plates, and at the sides near each end there is a nipple to which a rubber hose may be attached, one serving for filling the chamber with gas or air, the other one for discharging the same.

4. A collimator with an achromatic object glass at the end toward the air-chamber and a brass cover with a vertical slit in it at the other end. The width of this slit can be changed by a micrometer-screw attachment.

5. A Nernst lamp facing the slit end of the collimator, from which light is thrown through a condenser into the slit of the said collimator.

All of these parts are resting on brass standards which are screwed on an 8x4-in. channel bar 6 ft. 6¾ in. long, as seen in Fig. 1.

Manner of Operation

The pencil of parallel rays produced by the light of the Nernst lamp, after passing through the objective of the collimator is transmitted to the telescope in three sections. The upper half of the whole beam of rays passes unchecked and unchanged through the shutter of the telescope into the upper half of its objective. In its local plane this beam of rays produces a spectrum of Fraunhofer lines consisting of two straight and

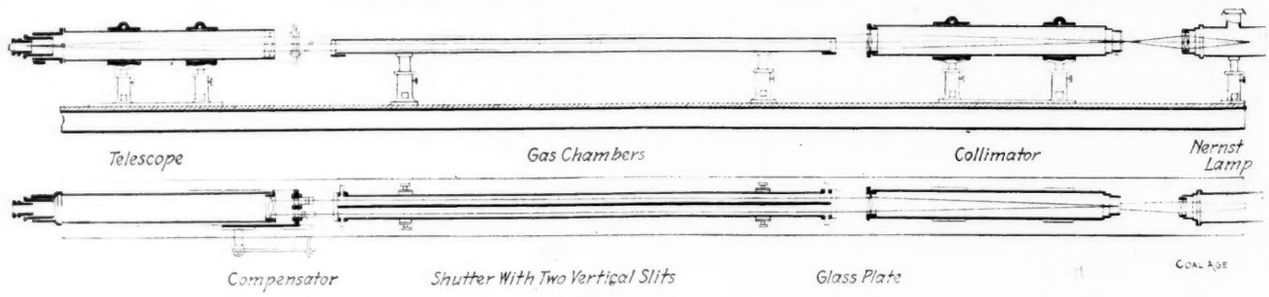


FIG. 1. THE INTERFEROMETER OF HABER AND LOWE

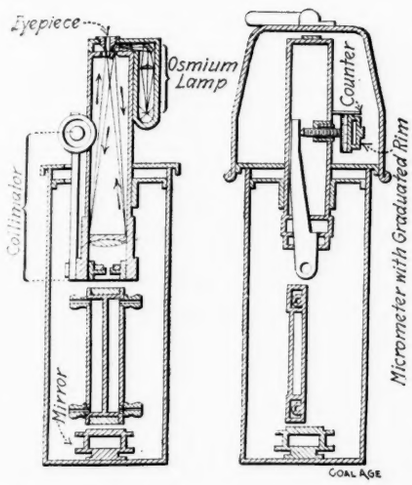


FIG. 2. A PORTABLE INSTRUMENT FOR GAS DETECTION

parallel black bands in a white field with colored fringes adjoining on both sides.

The lower half of the pencil of rays is cut into two equal parts by the metallic partition between the two chambers. Each part of the ray pencil enters through a compensator plate and by the right or left slit of the shutter into the telescope. By taking off the eye-piece of the telescope and looking through it, four luminous rectangles will be observed. The two upper ones belong to the upper half of the pencil of rays, while of the lower ones, the one to the right represents that part of the pencil of rays which has passed through the test-gas chamber and the movable glass plate, and the one to the left represents the part which has passed through the atmospheric air chamber and the stationary glass plate of the compensator. The rays passing through the lower half produce the same interference phenomenon as those going through the upper when the apparatus is set to zero; that is, as long as both chambers are filled with gases of equal refraction and the compensator plates are exactly parallel. On replacing the eyepiece of the telescope and looking through it, one sees the spectra of both halves separated by a horizontal black line, formed by the opaque metal roof of the chambers.

LIGHT REFRACTED BY TEST GAS

Substituting now another gas for the air in the right or test chamber, for example, a mixture of air and carbon dioxide containing 1 per cent. of the latter, the upper spectrum does not change while, in gradually charging the gas mixture, the bands of the lower system will slowly move to one side. As soon as the charging of the gas chamber is completed they remain stationary. Now, the same bands of the upper and lower systems do not coincide any more. By turning the graduated micrometer screw of the compensator, the lower system has to be brought back to its original position at the zero mark, when the same bands of both spectra will be as one again. The difference in the readings of the compensator before and after charging the gas mixture is a measure of the difference of refraction between this and atmospheric air of equal temperature and pressure.

From observations with varying percentages of gas, Doctor Löwe has tabulated the percentages of methane and other gases corresponding to different revolutions of the micrometer, complete or partial. The instrument has been in use now for a number of months at several schools of mines and collieries, and has given entire satisfaction.

A PORTABLE INSTRUMENT

Its only drawback is its size and weight, which preclude its easy transportation in the mines from place to place. Doctor Löwe has, therefore, studied out and constructed an instrument of reduced size which, though not as accurate as the larger one by one-fifth part, has the advantage of being portable. Its length is only 18 in. and its weight 10 lb., including the covering. Instead of a Nernst lamp which requires a current of 110 or 220 volts, which voltage is not always at the disposal of the operator, the smaller apparatus is provided with an Osmium lamp which needs only a small portable accumulator to supply it with current. As the lamp is attached to one side of the telescope, it is necessary to place a mirror opposite the gas chambers. The construction of the instrument is shown in Fig. 2 here below and the legend will explain its parts.

The larger instrument is in daily use at a state colliery at Gelsenkirchen for the examination of gases passing out of the air shaft.

For fuller information on the subject, especially on its mathematical aspects, I shall have to refer the reader to the *Zeitschrift für angewandte Chemic*, XXIII, 1910, Vol. II, Part 30, p. 1393, and *Zeitschrift für Elektrochemic*, Vol. 16, 1910, p. 39.

Both instruments are manufactured solely by the well known optical firm of Carl Zeiss, Jena.

I am indebted to Doctor Löwe for thoroughly explaining the instruments to me and for use of the cuts.

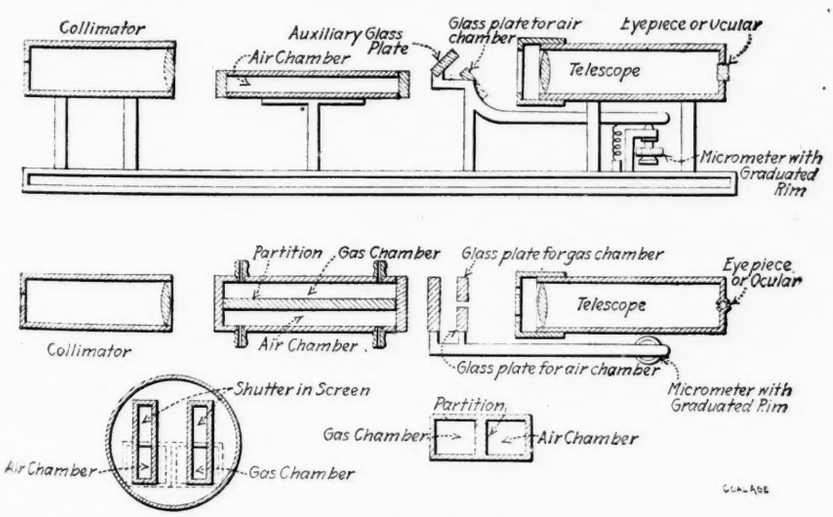


FIG. 3. THE INSTRUMENT AT GELSENKIRCHEN FOR EXAMINATION OF GASES LEAVING AIR SHAFT

In an article on "Steam Accidents," the *Engineers' Review* says it is patent to everybody that accidents are far more frequent at a colliery than at a mill. At a colliery alterations are never at a standstill. The upkeep of the plant is great and if there are several beds of coal to warrant it, fresh shafts are being sunk, so that the old order of things merges into newer forms, and perhaps unconsciously, conditionally less safe. The Bank Hall Colliery in England (where a fatality was due to the bursting of a flywheel) was no exception to this rule as there was a conglomeration of apparatus upon apparatus, boiler added to boiler, engines without numbers, and pipes great and small laid above and below ground to meet these requirements.

In the Queensland Mines Act there is a regulation which should have a tendency to keep the mine inspector on the alert, and provide against the manager having the excuse that he was unaware of the views of the inspector regarding the condition of the mine. Whenever an inspector has inspected any mine or machinery he must enter in a book to be kept at the mines for that purpose, his opinion of the actual condition of the mine or machinery at the time of such inspection and he shall also note what alterations or requirements he thinks necessary.

Who's Who—in Coal Mining

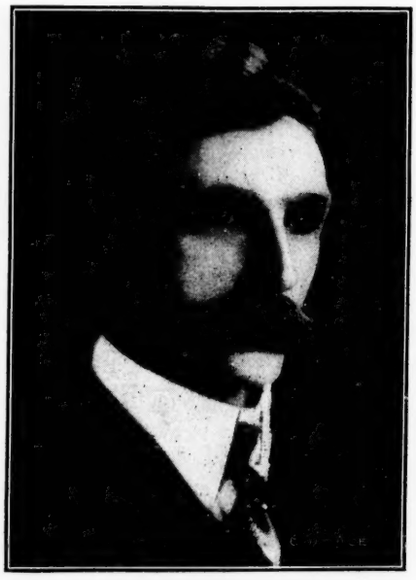
Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

Joseph A. Holmes, the present director of the U. S. Bureau of Mines, was educated at Cornell University, graduating from that institution in 1880. During and since his college course, he has devoted special attention to studies in chemistry (with laboratory courses in the chemistry of explosives, metallurgy, etc.) geology, electricity and general physics, surveying, and mining and metallurgy. He has visited mining regions in this and other countries and has examined both metal mines and coal operations, as well as plants connected with the treatment and preparation of mineral products.

From 1881 to 1891 Dr. Holmes served as professor of geology in the University of North Carolina. During these ten years while he was engaged in teaching, the vacation months were spent in professional work, examining mines in many localities. From 1891 to 1903 he acted as State Geologist and gave much attention to an investigation of quarrying, metal mining and metallurgical operations. In 1903 and 1904 he organized and had charge of the Department of Mines and Metallurgy of the World's Fair, at St. Louis, planning the exhibits to show mining and metallurgical operations. In 1904, when the Government fuel investigations were authorized by Congress, Dr. Holmes, who had inaugurated the work, was offered its supervision, but being unable then to give it the necessary time, he requested that other men should be appointed to associate with him and share in the burden of management of these Federal investigations. Acting on his suggestion, those in charge of this research work appointed Messrs. Parker and Campbell, of the Geological Survey, to coöperate with Dr. Holmes in the supervision of the fuel tests.

Early in 1905, J. A. Holmes was appointed by the Director of the Geological Survey to take individual charge of the fuel investigations as enlarged and continued, and of investigations of mine explosions, etc. From 1905 to 1910, this work was developed under the Geological Survey, but in the latter year all of these investigations were transferred to the newly created Bureau of Mines.

When the new Mining Bureau was first established, there was some difference of opinion on the part of high government officials as to who should be the first director of this new Federal department. President Taft, because of the friction which occurred with reference to the nomination of a man for the position, held the appointment in abeyance, taking plenty of time to consider the fitness of the different candidates who were proposed for the position. The wishes of mining men in all parts of the country finally prevailed over the personal desires of a few politicians, and Dr. Holmes was appointed as the first head of the U. S. Bureau of Mines. His selection met with instant approval, and the hearty coöperation which has been accorded him by all in the mining industries has proved without doubt the wisdom displayed in starting the initial work of the new bureau under his able direction.



JOSEPH A. HOLMES

Joseph Holmes is a member of the American Institute of Mining Engineers, the Mining and Metallurgical Society of America and other mining societies. He is also serving on the Mining Investigation Commission of the State of Illinois and is the personal representative of the United States on an International Mining Commission.

He inaugurated the movement for free entry into the United States of mine safety and rescue appliances. Since the duty on the import of mining machinery, and other material of like nature, is 45 per cent., the saving that has resulted to American mine operators in the purchase of safety appliances has amounted to a considerable figure.

The idea of having rescue work in this country carried on by private mine owners was greatly encouraged by Dr. Holmes. The result is that today hardly any coal-mining company of importance has neglected to organize systematic rescue work. The scheme of equipping a number of railroad cars as moving safety stations was one of the most valuable plans that he has inaugurated in connection with his national system of mine-safety work. Each of these cars is under the supervision of competent mine-rescue instructors, and in no other way could these teachers, who are in the employ of the Bureau of Mines, reach so many mining men, and at the same time be kept quickly available for emergency use in case of mine disasters.

It was Dr. Holmes who planned the establishment of the three state mine-rescue stations in Illinois. It was also in accordance with his suggestions that the Federal Mining Bureau located different mine-rescue and experiment stations at various localities readily accessible to the principal coal fields of this country.

In 1907, on the recommendation of J. A. Holmes, President Roosevelt secured the appointment by the governments of Great Britain, Germany and Belgium of one distinguished engineer from each of these countries to visit the United States. In company with these engineers Dr. Holmes visited the more important coal fields of this country to determine the extent to which the modern safety practices of other mining countries might be introduced in the United States.

Running a new Government Bureau, such as that which is now delving into the problems pertaining to safety in coal mining, is a job that requires a man of unusual tact and unlimited energy. Joseph Holmes is richly endowed with an excess of these two qualities. Only his force of character, united to dexterity of action and ease of manner, could have secured from Congress the recognition, financial and otherwise, which has so far been accorded the Bureau of Mines.

Many men have *weight;* Dr. Holmes has *momentum.* Lots of people know *what* to do; he knows *how* to do it. His diplomacy is the sort that enables a man, without deception or hypocrisy, to be seemingly the same to all men, yet varying with each, according to his peculiarity and according to the mind of the man at the time.

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This journal is interested solely in matters relating to the fuel industries, and is designed to be a medium for the free interchange of ideas, the detailed description of coal-mining practice, and the expression of independent thought calculated to benefit both operator and miner.

Contents

COAL AGE

The Smoot Bill

A bill recently reported by the Committee on Public Lands of the U. S. Senate through Senator Smoot, who introduced it originally to that body, permits the returning of all coal lands in Alaska, hitherto owned or even claimed, to the United States Government and the replacement of the present holding by a leasehold.

It gives power to the Secretary of the Interior to lease these lands and others not yet so held, in blocks of not more than 5 square miles and provides that no person shall hold any interest as stockholder or otherwise in any other parcel of coal land *thus* secured. It provides further that the area thus transferred shall be in not more than two compact blocks, each of which may be 2½ times as long as it is wide, and apparently if the Secretary pleases these may be oriented in any direction. Thus the holding of one individual may cover five miles of front and be one mile deep.

The holder shall pay a royalty to the government of two to five per cent. of the value of the coal when the fuel is mined. He shall also pay 25c. an acre for the first year's royalty, 50c. an acre for the second, third, fourth and fifth years and $1 per acre for every successive year. The lease shall last for 50 years at the option of the lessee and it may be renewed thereafter, if both government and leaseholder so desire, either under the original terms or subject to new conditions to be then agreed on.

The contract carries full easement rights, but permits the government to grant other easements over and under the same lands with appropriate compensation where such easements are necessary for the working of other coal lands by the lessees of the government.

The act seems designed to give legal title to the claimants whose fraudulent entries in the very face of latter-day sentiment have been so provocative of public clamor. True, dummy entries are no new feature in land-grants out of the sovereign; and thereto the case of George Washington may be cited. But modern opinion is strongly set against them and the act gives the claimants first choice. If the land is already owned or if the claimants can make good their claim, they do not have to relinquish the holding and we may well add here that the act no matter how framed could not divest them of such rights which are guaranteed by the constitution.

In fact if any man has a good claim enforceable in law, we cannot see why he cannot under this act add to it by leasing a plot of 5 square miles in area to replace any invalid claim he may also hold. As we read it, the proposed legislation should be entitled "An act to validate fraudulent claims in Alaska."

It is to be regretted that the recommendation of the Philadelphia section of the Mining and Metallurgical Society of America was not followed more closely. The known acreage of coal in the Bering River field is 50 square miles while the Mantanuska field is thought to cover 70 square miles. These are the only two really acceptable pieces of coal in Alaska. Thus 24 individuals could manage to acquire the whole area and they could well work quietly in harmony. Even less owners could control by making all their holdings five times as long as they are wide.

A large area of coal land is not necessary where the coal is easy of access or where it is broken up, and these are the Alaska conditions. Small mines and many of them are better suited to the requirements especially where, as in the Bering field, the roof conditions are treacherous in the extreme. Even if the holding was 3200 acres it is not likely it would be exploited as a unit. This is made the more probable by the fact that the beds of coal are numerous and run up to 50 ft. in thickness. The holdings are unreasonably large from every point of view;—their ease of access, their unsuitability for unit working, their thick-

ness and the small area covered by the whole field.

We do not consider the American people should seek to do anything more than safeguard the Alaskan public. Though American money bought the territory, the people of Alaska should be considered before all others in the disposal of the riches of that snow-covered land. The time has passed when empires and federations owning colonies can shape the business of the dependency to suit the needs of the larger unit.

Mining in Alaska will always be expensive owing to the sparsity of population, the severities of the climate, the folding of the measures, the condition of the coal, the distance from the markets and the shortage of good timber. The coal is variant and excellent. The sulphur and ash are both low. There has, however, been so much folding in the Bering River field that the coal is mostly ground to slack.

We do not like the new bill because it is not in accord with any of the proposals made by those whose judgment was competent and informed, because it returns the fields to those from whom the government has tried to wrest them, and because a solution could well be found which would open up the Alaska fields as speedily as the one which has been prepared.

Immunity from Tetanus

Whenever the Fourth of July recurs there are the usual references made to tetanus. The patriotic youth handles powder and burns or abrades his skin; tetanus somehow results and he dies with every muscle tense, probably from sheer exhaustion. The miner also handles powder, sometimes is burned by his lamp, often abrades himself and he is never subject to tetanus and it occurs to us to ask why?

The question is not given with the idea of making a final reply but solely for this reason: If the miner is not subject to tetanus, and if we can find out why he is immune, we may disclose what is the general cause of miners' immunities, whether those immunities are likely to continue and how they can be better assured.

Tetanus is a germ disease. The germ is not a worm hatched from an egg, but a plant derived from a spore. Moreover, it is an independent organism. It can live without parasitism and can go through all its life changes—first as spore, then as thread, then as rod with cat-o'-nine-tail appendages, lastly as a pin-shaped body with a new spore on one end, and back again to repeat the circle—without any help from a living organism whether animal or vegetal. But while it is thus independent it does not disdain to make use of animals. It may be found in the manure of horses and when it enters a human wound it multiplies and does well.

But it has limits of temperature. It becomes inactive between 57.2 deg. and 109.4 deg. F. But it does not necessarily follow from this fact that it cannot, if introduced into a wound below the lower or above the higher temperature, become imbued with life as soon as the blood heat furnishes the required incentive to activity.

Nevertheless, it appears that the temperature of inoculation must have its effect because tetanus is so much more rapid in its action in warmer climates, though the germ when incased in human flesh is at an equal temperature throughout the world, regardless of external heat. As an evidence of the fecundity of the germ in torrid climes, it may be stated that a man in the West Indies cut his hand with a broken plate at dinner and before the day was over he was dead. It is true that another cause might be suggested for the increased effect of the germ in the tropics. Where the body heat is easily maintained, the decreased metabolic action may permit the tetanus toxins to have a more rapidly fatal result.

Perhaps activity of the germ is necessary at its reception because the microscopic plant does not thrive in oxygen and must needs bury itself before it can develop. Yet here again it may be objected that the tetanus germ would find in the temperature of the epidermis sufficient heat to vitalize its flagging energy, because even the folds of the skin in a closed hand have a temperature of 99 degrees Fahrenheit.

It is, therefore, hard to believe that the low temperature of the mines is alone the cause of the proved inactivity of the tetanus germ. If, as in the case of the ankylostoma, certain changes had to take place outside the entertaining host, before that host could be entered, then the external temperature would be the dominant factor, but apparently that is not so. The human organism is ready to receive the tetanus germ in whatever stage of development it may be presented to it, and once admitted, that germ will multiply in the human tissue without intermediate evacuation. We are driven to other explanations than those which temperature supplies, and we are almost compelled to take the view that the immunity arises from the aseptic character of the mine waters and mine air.

In underground stables everything favors the growth of the plant. The manure, which for some reason not known, is a habitat of the germ, is also warming enough to aid its development and possibly dense enough to furnish it with the required anærobic environment. Then again such stables are in intake air, which is probably not as sterilizing as that found in the returns. These may be the reasons why tetanic spasms seize only those underground workers who have been injured while working in subterranean stables.

A great deal of study is being given to miners' diseases, but little activity is being expended on the specific elucidation of the factors favoring the spread of these diseases in the mine. The study is being left much as it is found in treatises on parasitic diseases, but in underground workings, conditions are simplified by uniformity of temperature and soil and consequently a revision of the science of etiology is needed to suit those conditions.

We are fully confident that the Bureau of Mines and the Marine Hospital Service will give germ diseases a treatment which will lead us to distinguish the bacteria and bacilli which are to be dreaded by mine workers from those which are, by the ruling conditions, unable to invade the mines. We congratulate Dr. J. A. Holmes that he has entered so interesting a field of investigation and called in such able coöperation.

Germs are not like men. They are of variant internal temperature and consequently they cannot endure the range of temperature borne by men who by increased metabolism succeed in maintaining an even internal temperature.

In France the coal operator will guarantee to the buyer the exact percentage of "large" coal, carbon, volatile matter and moisture which he demands.

Inquiries of General Interest

Questions are not answered unless accompanied by the name and address of the inquirer. This page is for you when stuck—use it

Working an Underlying Seam of Coal

We are working a 6.5-ft. seam of coal on the room-and-pillar system. As the rooms are driven up to the limit we draw back the pillars for a certain distance, depending on the condition of the roof. As this work proceeds we pull all standing timber and cave the place tight.

Overlying this seam, 175 ft. above it, is another seam of good coal about 7 ft. thick. Following is a record of the intervening strata, in the order in which they occur, reading from the upper seam down to the lower:

Hard sandstone	18	ft.
Coal	0.5	"
Soft rock	4	"
Coal	1	"
Hard sandstone	57	"
Coal	1.5	"
Fireclay	8	"
Coal	1.3	"
Sandstone	80	"
Boney Shale	4	"
Total	175.3	"

The 80 ft. of sandstone overlying the lower coal seam is soft and easily broken when the roof is weighting. Underlying the lower seam of coal, which we are working, is a very soft fireclay bottom.

I would like to ask if, in your judgment, the caving system adopted in the working of the lower seam will in any way jeopardize the later working of the upper seam. In other words how far above the lower seam will the roof breaks extend and will they disturb the upper coal seam?

THOMAS GOOD,
Supt. A. C. M. Co., Coal Dep't.
Washoe, Carbon Co., Mont.

It is often a difficult matter to give a direct answer to a question such as our correspondent asks, without a more thorough knowledge and intimate acquaintance with the district. The experienced gained in the working of the lower seam, by closely observing the action of the roof, together with an accurate knowledge of the intervening strata, will always be the best guide in answering such a question.

It may be safely stated, however, that, in general, with 175 ft. of intervening strata of the character named above there will be no difficulty experienced in mining the upper seam of coal, after the extraction in the lower seam is complete; provided a proper system of mining has been conducted in working the lower seam. In order to avoid unnecessarily disturbing an overlying seam, in the working of a lower seam, it is necessary to adopt and carry out a systematic plan of mining the coal and drawing back the pillars in that seam, so that the work will advance regularly and the overburden will settle uniformly on the waste or gob. If this is not done the irregularity of the roof settlement will cause the breaks to extend higher than they would otherwise.

We are informed there is considerable water in the strata intervening between these two seams of coal. The location of this water in the strata would have an important bearing on the action of the roof and the extent to which the strata would be disturbed. It would be impossible to predict with any degree of certainty the effect that might be expected in this regard. At the same time, under the conditions stated, no serious trouble need be expected.

Mine Gases

(a) Do you know of any tests or analyses having been made of gases formed or accumulated in the old workings of a mine that generates marsh gas (CH_4), when the same has been bratticed up tight for the purpose of holding back the gases that accumulate therein, it being no longer possible to ventilate the district thoroughly on account of falling roof? If so, what was the result of the investigation?

(b) Has any test been made, to your knowledge, of gas generated from decomposing timber, in mines? If so, what was the result of the investigation?

(c) What amount or per cent. of carbon dioxide (CO_2) is necessary to render firedamp, at its maximum explosive point, inexplosive?

(d) Do you approve of the sealing off of abandoned districts in gaseous mines, for the purpose of holding back the gases when it is no longer possible to ventilate such districts thoroughly on account of the falling roof? Please state reasons for your answer. When such an abandoned district is to be sealed off, how should the work be done? Is this the practice in any mining states?

F. I. PEARCE,
Deputy Inspector of Mines.
Indianapolis, Ind.

(a) Many samples of accumulated gas have been taken and analyzed by the chemist of the Bureau of Mines, G. A. Burrell, Pittsburgh, Penn. Mr. Burrell gives a number of the results of such analyses, in a paper read before the Coal Mining Institute of America, at Pittsburgh, December 20, 1911. This paper was published in COAL AGE, December 23, 1911, p. 348. Some of the large coal mining companies have likewise made analyses of such gases, in their own private laboratories; but, with few exceptions, the results of these analyses have not been made public.

(b) The process of the decay of timber is a slow oxidation of the organic matter of the wood. The carbon is oxidized to carbon monoxide or carbon dioxide, according to the supply of air. Under ordinary circumstances, carbon dioxide (CO_2) and water vapor are produced.

(c) A firedamp mixture consisting of pure methane or marsh gas (CH_4), at its maximum explosive point, is rendered inexplosive by the addition of one-seventh of its volume of carbon dioxide (CO_2).

(d) When it is no longer possible to thoroughly ventilate the abandoned workings of a mine so as to prevent the accumulation therein of dangerous bodies of explosive gas, the workings should be sealed off by building substantial air-tight stoppings in all the openings leading thereto. The work of building these stoppings should begin at the return end of the district and proceed in order toward the intake end, the intake stopping being built last.

Entry "Sights"

Will you kindly state what is the best way to hang sights in an entry? Should the sight line be located in the center of the entry or a short distance from the rib? Please give reasons for your answer.

READER.
Streator, Ill.

The question of whether the sight line should be located in the center of the entry or at the rib is one of preference. Most entry drivers prefer the sight line located about 1 ft. from the off rib of the entry, or on the opposite side from the entry crosscuts. When the sight line is located in the center of the entry the sights are often disturbed and frequently lost. In this position also, it is more difficult to keep the entry straight than when the line of sight is close to the rib.

The Carbide Lamp and Carbon Dioxide

In the June 8 issue of COAL AGE, in the last paragraph on p. 1136, J. T. Beard states that "The carbide lamp will burn in an atmosphere containing over 50 per cent. carbon dioxide."

This statement calls to mind a paper read by G. A. Burrell, chemist of Pittsburgh Testing Station, at the December meeting of the Coal Mining Institute of America, and published in COAL AGE, Dec. 23, 1911, p. 348, in which Mr. Burrell called attention to a carbide lamp that burned until there was 6.3 per cent. of CO_2 in the air, at the moment the lamp flame was extinguished.

These two statements are somewhat confusing, as to the least amount of carbon dioxide in the air that will extinguish a carbide lamp. An explanation is therefore desired so that a proper understanding may be had by those who use these lamps in the mines.

The following table will, I think, show the probable composition of the atmospheres indicated respectively by the statements of Beard and Burrell, to which I have referred:

Gases	Beard	Burrell
Carbon dioxide, CO_2	50 per cent.	6.3 per cent.
Oxygen, O_2	10.5 " "	11.7 " "
Nitrogen, N_2	39.5 " "	82.0 " "

The table shows a wide difference in the percentage of nitrogen as well as that of carbon dioxide, while the percentage of oxygen, in both cases, is practically the same. It seems to me, therefore, that the flame of a carbide lamp does not depend on the percentage of carbon dioxide in the atmosphere surrounding the lamp, but rather on the percentage of oxygen present in the air. The question is naturally suggested, "Would not the lamp burn equally well in an atmosphere in which all of the nitrogen of the air was replaced by CO_2? If so, it would seem absurd to regard the carbide lamp as affected by the percentage of CO_2 present in the atmosphere."

Does not the question reduce to this; namely, that in order to burn acetylene gas there must be a certain percentage of oxygen present in the air. The oxygen alone supports the combustion of the gas, and on this account it would seem that the condition of the atmosphere that will support an acetylene flame should be estimated on the percentage of oxygen present in the air, rather than on the percentage of carbon dioxide present.

M. S. HACHITA,
Chemist, Lehigh Valley Coal Co.
Wilkes-Barre, Penn.

The two statements referred to by our correspondent, giving the percentages of CO_2 in air in which a carbide lamp is extinguished, are probably, each of them, approximately correct. It is well to notice, at the start, that the two statements refer to different kinds of atmospheres. The statement in Mr. Burrell's paper refers clearly to a residual atmosphere obtained by placing the carbide lamp "under a 10-liter bell-jar" and allowing it to burn until the atmosphere remaining would no longer support the combustion, and the flame was extinguished. My own statement refers to an artificial atmosphere formed by the addition of CO_2 to air in its normal condition.

The former statement (Burrell) refers to a condition rarely obtained in a mine. Mine air is always contaminated with a greater or less quantity of CO_2 generated in the mine. The atmosphere, therefore, is an artificial and not a residual atmosphere. The only time when a residual atmosphere is possible in a mine is immediately following an explosion of gas or dust in a close room or heading.

As our correspondent states, the combustion of the flame of a lamp depends more on the percentage of oxygen present in the air than on the percentage of any extinctive gas, such as carbon dioxide or nitrogen. The analyses of the two atmospheres given, though clearly incomplete, closely approximate each other in the percentage of oxygen present at the moment the flame is extinguished. In a general way, this lends support to the suggestion made that carbon dioxide and nitrogen are equally effective in extinguishing flame, but does not warrant stating this as a fact.

There are several factors that determine the extinction of a lamp flame. Quoting from "Mine Gases and Explosions," p. 289:

"Briefly stated, the extinction of a lamp flame is directly due to an interruption of the flow of the combustible to the flame, or to such a depletion of the oxygen of the air supporting the flame, or dilution of the atmosphere about the flame with extinctive gases, as to separate too widely the individual centers of combustion. The heat produced is then insufficient to maintain the required temperature of the gases, and as a result the flame dies away, the direct cause being the absorption of heat by the large proportion of incombustible gases present in the air."

From this it is clear that the immediate cause of the extinction of the flame of a lamp is the lack of sufficient heat to maintain the temperature required for the combustion. I believe I have made the matter clear as to the difference between the residual atmosphere referred to by Mr. Burrell and the artificial atmosphere to which my own statement refers. The two analyses naturally differ widely in the percentages of carbon dioxide and nitrogen given; but agree, approximately, in respect to the percentage of oxygen present at the moment the lamp flame is extinguished.

Incidentally, it may be remarked that Mr. Burrell in his paper gives the percentages, $CO_2 = 6.3\%$, and $O_2 = 11.7\%$; while our correspondent assumes that all the remainder (82%) is nitrogen. If the air in the bell-jar was originally normal (O_2, 20.9%; N_2, 79.1%) this assumption is incorrect, as an inspection of the following equation, expressing the reaction that occurs, will show:

$$2\ C_2H_2 + 5\ O_2 = 4\ CO_2 + 2\ H_2O$$

The above equation shows that five volumes of oxygen are required to satisfy two volumes of acetylene gas; four volumes of oxygen, combine with the carbon to form four volumes CO_2, while one volume of oxygen combines with the hydrogen to form two volumes H_2O. In the reaction, therefore, five volumes of the oxygen of the air go to form six volumes of carbon dioxide and water vapor. Since the volume of water vapor formed is just one-half of that of the carbon dioxide formed, the percentage of water vapor in Mr. Burrell's analysis would be $6.3 \div 2 = 3.15$ per cent. This gives a total percentage of carbon dioxide and water vapor, $6.3 + 3.15 = 9.45$ per cent. But, since five volumes of oxygen combined to form six volumes of these two products, the oxygen consumed would correspond to a percentage of $\frac{5}{6} \times 9.45 = 7.875$ per cent. Adding to this the 11.7 per cent. of free oxygen, in Mr. Burrell's analysis, gives 19.575 as the total percentage of oxygen concerned in the reaction.

The volume of nitrogen in the air corresponding to this percentage of oxygen is

$$\frac{79.1}{20.9} \times 19.575 = 74.08\ \textit{per cent.}$$

On this basis, the probable analysis of the residual atmosphere corresponding to Mr. Burrell's figures would be as follows:

Carbon dioxide CO_2	6.30 per cent
Oxygen O_2	11.70 " "
Water vapor HO_2	3.15 " "
Nitrogen N_2	74.08 " "
Other gases	4.77 " "
	100.00 " "

J. T. BEARD.
New York City.

Circular Shafts

What are the advantages claimed for circular shafts?

Chicago, Ill. MINING ENGINEER.

Mining engineers in Great Britain claim that the circular shaft can be more rapidly sunk than the other forms, that it is stronger in the sense that it offers a uniform resistance to the strata all around its circumference, and that it has an advantage in ventilation because of the circular periphery. Then, as they point out, pumping appliances, pipes, electric cables, telephone, etc., can be suspended in the shaft in the spaces behind the ends and sides of the cages.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Gas and Oil Wells in Mining Regions

Discussions have arisen at various times, during recent years, in reference to the danger growing out of drilling gas wells through the strata of coal mines. That there is danger in mining under these conditions cannot be denied, even when the location of the well is known and precautionary measures can be taken with respect thereto.

There is, however, one phase of the matter that has been given too little attention in the past and, as a result, we, today, are leaving a fearful legacy of death and the destruction of property, to generations to come. I refer to the hundreds of oil and gas wells, productive and nonproductive, that have been drilled, anywhere and everywhere, through coal seams and then abandoned without even a record being made to mark the place. Many of these wild-cat wells, drilled years ago, were good gasers; but, as gas was then of little or no value, the wells were slightly plugged, the casing drawn and, in many cases, the location of the well forgotten.

The danger lies in the fact that when the drill has tapped even a small flow of gas the latter will work its way through the overlying strata, hundreds of feet above and around the well. In proof of this statement, I recall where several country coal banks (mines) could not be worked on account of gas when oil wells in that vicinity were abandoned. In one of these mines there was an explosion, a few years ago, and some miners were badly burned. In this case, the gas appeared after the drilling of a well in the ravine below the coal seam and half a mile away. The drill did not pass through the coal at all.

In another case, in the same locality, near New Athens, Penn., in 1875, a well was drilled for oil. No oil was found, but there was a strong flow of gas. This being at that time a useless product the well was plugged, the casing drawn and the equipment moved to a new location. Two weeks later, some boys noticed gas bubbling in the creek two miles away and lighted it. The gas continued to burn there for years. About the same time, a well was drilled on a branch of the same creek; this well, also, did not pass through the coal, yet the gas permeated the coal seam to such an extent as to render it unsafe to mine.

Arthur Neale, in the June 29 issue of COAL AGE, p. 1255, writing on the matter of drilling gas wells through abandoned or worked-out portions of mines, rightly suggests that there should be legislative relief.

From my knowledge of the cases I have cited and of the fact that hundreds of prospecting or wild-cat wells have pierced one or more coal seams, and as no record of the location of such wells has been kept I can readily forsee that a terrible state of affairs may develop when these coal seams are worked by future generations. To my mind, it would seem only proper that every precaution should be taken in order that we shall not leave a harvest of death and destruction for others to reap.

Since experience has proven that the plugging of a well will not prevent the escape of gas into the surrounding strata, would it not be wise to devise some means of allowing an escape by keeping the well open, instead of drawing the casing and closing the well at the top as has been the practice.

Further than this, every well of any kind that is drilled through coal or other mineral should be surveyed and recorded in the Recorder's office, in the county, where the well is located, and a location certificate filed with the state Department of Mines, so that when new fields are developed in the future the danger can to some extent be provided against.

The loss of 31 lives, some years ago (1891), at Dunbar, Penn., where the location of the well was known, and when the miner was driving toward it with the intention of tapping it, serves to show what may and undoubtedly will occur, in future years, when some of these abandoned and entirely forgotten wells are tapped by the miner's pick.

Let us by all means have some effective legislation on this matter.

S. U. PHILLIPS,
Foreman, Standard Mine.
Argentine, Butler County, Penn.

Examining a Mine

In gaseous mines, an examination of all working places should be made three hours before each shift. Where gas is found, a notice to that effect, giving the time of examination, should be posted conspicuously at the entrance of the mine. If the mine is exceedingly gaseous, the time between examination and the beginning of a shift should not be more than one-half hour. Miners who knowingly enter a posted chamber or district should be severely punished.

FIREBOSS.

Pittston, Penn.

Humidity of Mine Air

James Ashworth, in his discussion of Karl Schoew's paper on temperature and moisture, COAL AGE, July 6, pp. 17 and 18, has drawn attention to a weak point in the latter's paper. While he does not perhaps make it as clear as he might in his paper, I believe that Mr. Schoew means to convey the idea that 94 per cent. humidity is essential in mine air, irrespective of the temperature. In this I agree with him, except as to the arbitrary figure, 94 per cent. Why not make this 100 per cent., as a minimum? The difference being small and the method of measurement crude, the control of humidity within any exact limits, in the mine, would be difficult.

I have had no experience in mines where the natural temperature was higher than 62 deg. F. For such a temperature or less, I would recommend a degree of moisture, either in the form of vapor or water in the intake, equivalent to 100 per cent. humidity. A natural mine temperature of 90 deg. F. is entirely out of range in our country, and need not be considered; and even in foreign countries I have noticed only possibly two or three mines, in Belgium, that had this temperature; except it might be from other than natural causes; as, for example, spontaneous combustion, particularly in the mines of Upper Silesia.

I do not believe I would recommend 100 per cent. humidity in mines where the temperature reached 90 deg. F.; but cannot state at what temperature a saturated atmosphere should be discontinued. This, however, is not a matter for our concern, as it is far above any temperaure within our practice.

Mr. Ashworth, in his final paragraph, unless I misunderstand him, gives a wrong impression. Water in the form of vapor has no absorptive power on carbon dioxide gas, and no effect of this kind is realized until the air current carries more water than is represented by 100 per cent. humidity.

FRANK HAAS,
Consulting Engineer,
The Consolidation Coal Co.
Fairmont, W. Va.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Pennsylvania Anthracite Mine Foremen's and Assistant Mine Foremen's Examination, 1912

(Selected Questions)

Ques.—What precautions would you take in mining two veins, each 7 ft. thick, separated by 25 ft. of rock?

Ans.—Accurate surveys and maps should be made of the workings in each seam and these should be extended, at least once in six months. All entries, rooms and pillars in the lower seams should be kept under the corresponding entries, rooms and pillars in the upper seam. To insure this being done, all entry and room sights should be put up by the mine engineer or surveyor, with the transit and not with a compass. The accuracy of the surveys should be checked, from time to time, by a drill hole sunk from the upper seam to the lower. The working face in the lower seam should generally be kept about 20 or 25 yd. ahead of that in the upper seam.

Ques.—(a) Give a sample of a report such as you would make after making your morning examination, finding gas in three places, bad roof in two places, and a fall in B airway interfering with the air current. (b) State your duty acting as a mine foreman or assistant foreman, after making such a report.

Ans.—(a) The report should be made out by the person making the examination, immediately after the work is finished. The report should read about as follows:

"I have carefully examined all the rooms, entries, crosscuts and headings, in my district, embracing the A, B, C and D airways and adjoining workings, together with the entrances to the abandoned and void places, and find same in safe condition for workmen to enter, except the following places, which are unsafe and have been fenced off and marked with proper danger boards:

"Fall in B airway at mouth of rooms 17 and 18 and bad top in each of these rooms; gas in rooms 19 and 20 and at the face of B airway. No open lights must be used on B airway inside of room 12." (b) The assistant mine foreman, having made this examination and report, should remain at the mine entrance till the arrival of the foreman and inform him, in person, of the nature and location of the dangers. As mine foreman, he must see that no one is allowed to enter the danger zone till the danger is removed, except the men he appoints to do this work.

Ques—State what in your judgment are the most essential qualifications to make a successful mine foreman.

Ans.—A thorough knowledge of mining principles and conditions; a practical experience in mining coal; knowledge of human nature; tact and ability in the handling of men; and an honest, sober, industrious character.

Ques.—The water gage measures 4 in. in an airway near the foot of the upcast shaft, while 1000 feet inside of this point, in the same airway, the water-gage reading is only one inch. Explain what causes the difference?

Ans.—The water gage, as used in the mine, always measures the difference in pressure, per unit of area, between the intake and return, at the point where the reading is taken. For this reason, it only indicates the loss of pressure inside of this point. The two readings are respectively proportional to the mine resistance per unit of area, or the potential of the airways inby from the point of observation. As this point approaches the head of the entry, the water-gage approaches zero.

Ques.—(a) If a fan produces 100,000 cu.ft. of air per minute with a pressure of 3.3 lb. per sq.ft., what is the horsepower producing the ventilation? (b) How much would the pressure per square foot have to be increased to increase this quantity to 150,000 cu.ft. per minute?

Ans.—(a) The horsepower producing the circulation is

$$H = \frac{Qp}{33{,}000} = \frac{100{,}000 \times 3.3}{33{,}000} = 10\ hp.$$

(b) The pressure varies as the square of the quantity of air in circulation; or the pressure ratio is equal to the square of the quantity ratio. Therefore, calling the increased pressure x,

$$\frac{x}{3.3} = \left(\frac{150{,}000}{100{,}000}\right)^2 = \left(\frac{3}{2}\right)^2 = \frac{9}{4}$$

$$x = \frac{3.3 \times 9}{4} = 7.4 + lb.\ per\ sq.ft.$$

The pressure must therefore be increased $7.4 - 3.3 = 4.1$ lb. per sq.ft.

Ques.—What is the effect on the human system of inhaling large quantities of each of the following mine gases: carbonic acid, sulphureted hydrogen, carbonic oxide and afterdamp?

Ans.—Death, assuming that the time of inhalation of the gas is not indefinitely prolonged.

Ques.—What precautions would you take to prevent the accumulation of gas in the faces of abandoned workings?

Ans.—Conduct a sufficient current of air around the face of the old workings, and see that the air course is timbered so that it will not be closed by a fall or squeeze. Use brattices wherever needed to cause the air to sweep the void places in the roof or elsewhere.

Ques.—What are the most positive indications of a mine squeeze?

Ans.—The mine timbers generally give the first warning by crushing and breaking in an unusual manner, accompanied with a chipping off of the rib coal in entries and rooms. When the bottom is soft and the roof hard, the squeeze is indicated by the heaving of the floor. The pillars and timbers alike appear to sink into the floor. At other times, the roof sags heavily and the pillars give signs of taking the weight by the constant "nipping" of the coal along the ribs of openings.

Ques.—(a) If a breast is driven a distance of 500 feet on a rising grade of 20 degrees, what would be the difference represented on the mine map? (b) What height has the breast attained above the heading?

Ans.—(a) All distances represented on the mine map, unless otherwise specified, are horizontal distances. Any distance measured on the pitch or incline must be first reduced to the equivalent horizontal distance before the same is plotted on the map. Thus, 500 ft. on a grade of 20 deg. corresponds to

$500 \times \cos 20° = 500 \times 0.9396 = 469.8$ ft.

(b) The vertical rise is found by multiplying the pitch distance by the sine of the pitch angle; thus,

$500 \times \sin 20° = 500 \times 0.342 = 171$ ft.

Ques.—If a fire occurred at or near the intake of a mine, state what action you would take.

Ans.—Notify the inside men by phone, at once, to send word quickly around the working faces. Instruct them to withdraw promptly, and station reliable men where necessary to direct the men by the safest roads to the exit. Meanwhile short-circuit the air at a point inby from the fire to prevent the smoke and gases of the fire being carried into the workings, if so doing will not cut off the escape of the men and get water on the fire as quickly as possible. Action will, in every case, depend on the arrangement. Every mine should be planned with that end in view which will make the escape of the men possible, under any reasonable circumstances.

Sociological Department

For the Betterment of Living Conditions in Mining Communities

First Aid Not a Fad

JONATHAN M. WAINWRIGHT*

In a previous issue, that of July 20, I discussed the necessity of assuring safety by granting revocable licenses to mine workers, just as we grant them today to physicians and chauffeurs. It was pointed out that the public was the real party at interest and not the operator, because the latter would inevitably require the public to pay him for assuming such a part of the burden as he was not able to remove by the utmost circumspection in the operation of his mines.

REMEDIAL MEASURES

We now come to the second problem which the public must face when it begins to compensate for accidents; that is, what can be done after an accident has occurred to prevent any permanent, partial, or total disability, and how to diminish as much as possible the period of temporary inability to work, or in other words, how to make the result of the accident as slight as possible to the individual.

There is one factor in the reduction of the serious character of accidents which admits of some general discussion. This is the instruction of employees in first aid to the injured. An incident which recently happened near Scranton will serve as a text for this subject. An explosion of gas occurred in a chamber of a coal mine and three men were overcome. A well drilled first-aid team was on the scene in a short time and two of the men went into the chamber to rescue the others. These men were both overcome by gas and did not return, so that there were five men apparently dead in the chamber where the explosion occurred. By this time some of the men with oxygen helmets came up and they removed, rapidly and without trouble, the five who were apparently dead.

RESUSCITATION AFTER SOME DELAY

Thoroughly instructed first-aid corps at once went to work on these unconscious men and were able to revive four of them by means of artificial respiration. This had to be kept up in one case for 1 hr. 20 min. The fifth man was undoubtedly killed outright at the time of the explosion. Here, therefore, the fact that there were men at hand who were instructed in first aid undoubtedly resulted in the saving of four lives. If the system of workmen's compensation had been in force, this one incident would have saved the employer in question more money than would be required for years of efficient first-aid instruction.

In discussing the question of provision for first aid to the injured we will omit entirely the humanitarian aspect of the subject and consider it wholly from an economic standpoint. The saving resulting from proper knowledge of first-aid treatment among employees in any industry lies, first, in the fact that, as in the incident above noted, proper first-aid treatment will frequently save life itself. Second, even in accidents which do not threaten life the danger of complications which may prolong the employee's disability or which may make his disability permanent can be very much diminished if proper first-aid treatment is applied.

AMPUTATION OF TWO OR THREE LIMBS RARELY FATAL IF FIRST AID IS EFFECTIVE

Let us take first the accidents which threaten life. In the dangerous trades of the United States accidents occur every day which are so serious that the unfortunate victims of them cannot recover if they have to wait for assistance until they reach a distant hospital or until a physician can be found and brought to them. If the victim's life is to be saved, the work must be done in the first five minutes by men working near-by. For example, a man may have an arm or a leg run over or terribly crushed or lacerated by machinery. There may be profuse bleeding and if the man's life is to be saved this bleeding must be checked by fellow workmen within the first few minutes. If the man has been allowed to bleed beyond the point of possible recovery it will make no difference how elaborate the hospital or how skillful the surgeon may be whom he may reach an hour or two later.

Any surgeon who is working in hospitals having a large accident service will admit that every year he sees men with crushed limbs which require amputation. The lives of such patients he cannot save because so much blood has been lost before he has seen them. On the other hand, improvements in surgical technique have been so great in recent years that an accident involving the amputation of one limb should *never* prove fatal and an accident requiring the amputation of two or even three limbs should rarely result in death provided the bleeding from the injured part has been stopped immediately after the injury.

MINOR ACCIDENTS

The usefulness of first-aid treatment in preventing disastrous results in less serious accidents is probably even greater from an economic point of view than in accidents threatening life. In the first place this is because the less important accidents are much the more numerous. Perhaps the greatest economic value of all first-aid work is in the prevention of blood poisoning resulting from the countless number of wounds of all kinds which are daily being produced in various industries. If an ordinary wound is kept clean from the moment it is produced, it will heal in very few days and, unless it is in the hand or interferes with walking, it may not keep the individual from his work at all. On the other hand, if dirt is allowed to get into this wound, blood poisoning may result and no one can tell what the ultimate consequence will be.

The least that can happen will be that the wound will take a very much longer time to heal and the period of absence from work will be changed from a few days to a period of months or even years. If the only result of blood poisoning has been the extra loss of time, the individual will be very fortunate. If it has been severe, he will be very lucky if he is not left with a stiff finger, hand or knee as the case may be. Any of these conditions may prevent the individual from returning to his former occupation. Merely because his wound was insufficiently covered so that dirt got into it, the individual will have a permanent partial disability and will have to work at lower wages for the rest of his life. In cases still more severe this same blood poisoning which may easily be prevented, may result in the amputation of a limb or even in the loss of life.

THE WORKMAN'S NEIGHBOR DETERMINES THE SEVERITY OF HIS INJURY

When we realize that all these serious results may be prevented simply by properly covering the wound with sterile gauze at the time the injury occurs we can get some idea of how important it is that in places where accidents are common the necessary gauze and other materials should be provided, and what is equally important that there should be someone found near by who can intelligently apply them. Promptness in dressing wounds

*Chief surgeon, Moses Taylor Hospital, Scranton, Penn.

is just as necessary for preventing blood poisoning as is promptness in caring for serious injuries which threaten life. The important thing is what is done in the first few minutes after the injury, as this will often determine whether the wound will be clean or whether it will become poisoned, that is whether the individual will be back at work in a few days or whether he will be disabled for months, whether he will have a permanently useless limb, whether he will need to have an amputation of that limb, or even whether he will lose his life. The elaborate hospital and the skillful surgeon miles away are not the important factor. The main question is, does the man at the next bench know how to treat wounds and what materials does he have at hand?

Fractures

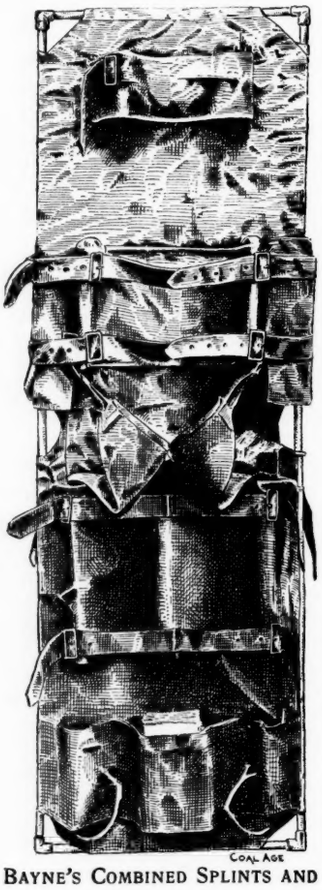
Many fractures when first produced are not especially serious and after they have healed the injured limb need not be in any way abnormal. However, through rough handling or through failure to support the broken bone properly while the injured person is being removed the fractured edges may become displaced and other serious injuries may be produced after the accident which will make the consequences much more serious. Improper handling or the failure to give proper support by temporary splints may produce additional injuries which will prolong the disability and which, indeed, may make it impossible ever to restore the limb to its former condition of usefulness.

Similar illustrations of the importance of first aid in diminishing their evil effects could be given for all classes of injuries. Enough has been said, however, to show in a general way the great economic importance of having a large proportion of men in all industries instructed in the simple rules of first aid to the injured. It is not an expensive or complicated matter and any intelligent workman will learn in a few lessons how to do the simple things necessary at the time of immediate accident just as well as a skillful surgeon. If the latter happened to be in a machine shop at the time a man received a severe cut, he would do nothing more than cover the wound over with sterile gauze, apply a bandage so the gauze would not fall off and then he would send the man to some point where permanent treatment could be given. Any mechanic can be taught to do the same, as well as a surgeon.

The methods by which first-aid instruction can be given and the materials which should be supplied vary so much with different industries that no general rules can be laid down. However, every employer of labor should realize that even now it is more economical, and when the compensation acts come it will be absolutely imperative that no one be hurt in a given industry or in a given plant or on any property without being able to find someone at hand who is able to find for him proper first-aid materials and to apply them at once in the right way.

An Adjustable Mine Stretcher

The Bayne stretcher, illustrated herewith, appeared in a recent report of the Royal Commission on Mining of the Dominion of New Zealand. From the appearance, it seems that the device is intended to dispense with the need for preliminary bandaging with splints.



Bayne's Combined Splints and Stretcher

If that is the scheme, it is clear that the appliance is open to considerable criticism, for when used it necessitates the lifting of the victim, before his limbs, if injured, are in any way supported. The probable result of placing a man on such a stretcher would be a simple fracture made compound. It is well nigh impossible, moreover, to make a stretcher do the work of splints.

A Stretcher Which Prevents the Patient from Slipping

However, there are some excellent features in this appliance. The patient is prevented from slipping, and the apparatus can be used, if necessary, as a breeches device for hoisting the man up an airway.

The stretcher is designed for moving the injured when mine accidents occur. Underground injuries are made more agonizing and serious by the long delays intervening between their occurrence and the arrival of the patient at the hospital. This makes them more distressing than those which occur above ground, and the cramped head room in the mines makes the handling of a stretcher less easy to the bearers. It is to provide for these conditions that the stretcher is designed. It is intended to save some of the lost time; but, as has been seen, time spent in proper splinting and bandaging is by no means lost.

The stretcher is constructed of strong wire woven on a tubular frame to form a litter.

A Combined Stretcher and Splint

In placing the disabled on the stretcher the head is held in a padded frame, the body in an adjustable splint, which, in cases of broken ribs or injured back, can be enlarged to prevent pressure. The thighs are held firmly on a canvas seat, which also supports the weight of the body. The legs are in splints, which protect and hold firmly any injured part, and the feet are held fast by being strapped to the frame.

While being carried vertically each part is held in position by broad leather straps, which can be made to take their proportion of weight by adjustment. In the case of injury to the pelvis the canvas sling must be put out of use, and the straps and arm rests will carry the body. If the legs or feet are the affected parts the slings and straps are so arranged that the patient is not inconvenienced in any way by the weight.

The whole is covered with strong canvas, under which a blanket is placed to keep the patient warm, and an apron is added which covers the figure and straps to the frame. The necessity for first-aid requisites is met by having attached to the stretcher a sealed box containing bandages and lint.

Suited to Difficult Service

The stretcher possesses the following advantages:

(1) It can be easily carried, as it weighs only 50 lb. It can be placed in the cage in any shaft, and lowered and conveyed quickly to the part of the mine where it is required. (2) When the patient is placed upon it, the rough ground does not affect his back, as the wire is strong enough to prevent pointed stones being felt. (3) The limbs are in a natural position, and movement is prevented. (4) It can be taken up a winze by attaching a rope to the top, and it can pass down traveling ways in steeply pitching rooms. (5) It can be carried in a horizontal or vertical position, and where it is necessary to pass obstacles or falling water, it can be placed on its side without injuring the patient.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

Another bill to provide a permanent supply of coal for the use of the Navy has been introduced by Representative Booher. The same bill is intended also to establish a system of leasing coal lands in Alaska. It permits any settler or other claimant under the public land laws of the United States to lease any of the lands of the United States in Alaska for the purpose of exploitation. No lease is to be for more than 3200 acres and the lessee is to pay not less than 3 per cent. of the value of the coal for sale at the mine and an annual rental of 25c. per acre the first year, 50c. per acre for the second, third, fourth and fifth years, and $1 per annum thereafter, except that the rental is to be credited against the royalties accruing for the year. The President is authorized to retain such lands as he may desire for the use of the army and the navy, and the funds obtained from the leasing system are to be used in the improvement of roads in Alaska, etc. A good many detailed provisions designed to facilitate working of the law are also made.

An important investigation which may result in a considerable inquiry into the coal situation has been undertaken by the Interstate Commerce Commission in connection with the steel business. On its own motion the Commission has directed that there shall be an inquiry into the rates, practices, conditions, of transportation, etc., affecting steel, cement and the materials used in the manufacture of steel and iron. This, of course, includes coal and may give considerable scope for the study of certain phases of the coal business not heretofore fully looked into. The exact extent to which the commission is likely to go in that connection has not been determined, but it is said to be still under advisement. The inquiry is understood to be very largely intended as a study of the United States Steel Corporation, notwithstanding the fact that that concern has already been so fully looked into from every possible standpoint.

Delegate Wickersham, of Alaska, has framed a new bill for the purpose of amending the act to encourage the development of coal deposits in Alaska, approved May 28, 1908. He now proposes to make the law read rather differently, so as to permit the consolidation of claims by including in a single claim or purchase not more than 2560 acres of contiguous lands. In section 2 he gives the United States the preference right to purchase as much of the product of Alaskan mines as may be necessary for the use of the army and navy. Sections 3 and 4 are directed against monopolies which may be intended to control the mining purchase or transportation of coal. Section 5 permits any person who has located coal land and whose location has been contested to bring a suit in equity against the United States. If it is found that he has been prevented from completing his location by any executive order, etc., the court is to enter a decree in conformity with the law confirming his title.

Alabama

Birmingham—The Republic Iron & Steel Co. has consummated a deal, July 19, whereby it has acquired 2900 acres of coal-land mines and equipment of the Palos Coal Co. A considerable sum of money will be spent to increase the output. The product will be used entirely for coke.

Gadsden—It is said that the opening of the Chattanooga furnace near here has caused the mines along the line of the Tennessee, Alabama & Georgia R.R., to be put in operation. The furnace will resume active operations in September, but the mines are being put in operation at once, in order that a supply of ore and coal can be had in advance.

Mobile—The Mobile & Ohio R.R. own 1000 ft. of water front above One Mile Creek, and this property is to be reclaimed from the marsh and converted into docking space, with accommodations for the largest vessel entering any of the Mexican Gulf ports. Among the improvements which will be erected on the property is an electrically equipped coal hoist said to be the only one of its kind south of Norfolk.

Arkansas

Clarksville—The majority of the mines of the Spadra anthracite coalfield began operation July 8. The Pennsylvania Mining Co., was never shut down. It is understood, however, that three mines are still idle.

Idaho

The coal lying in the Clearwater countries which were formally withdrawn from entry are now to be offered to the public. The restrictions set forth by the government is that it reserved the coal and the right to prospect for and take out minerals.

Illinois

Petersburg—The property of the Winslow Coal Co. has been bought by Herman Bryan, who will operate their mine. It is expected that a large force of men will be employed.

Princeville—The accusation that the Taylor Brothers Coal Co. has been hiring miners who have not passed their county examinations and are without their legal certificates has been found to be untrue. The company was exonerated completely following an investigation made by the Peoria County Miners' Examining Board.

Rutland—The residents of this place are to get coal at $2 a ton as a result of the agreement which exists between the village and the coal operator which allows him to mine coal from under the village street.

Springfield—Rumors are abroad that English capital may, in the near future, control the Illinois coal mines. The rumor is unofficial and may have nothing in it.

Streator—It is reported that the miners of No. 4 mine of the Harrison Coal Co., have refused to enter the mine for the past two weeks. The reason given for this action is that one of their members, a few weeks ago, was taken ill and had to lay off from work, and when he returned to work in the old mine the pit boss failed to give him his old job, and placed him elsewhere. According to the articles of agreement between the operators and the union, a sick member must be reinstated as before he was taken ill. The refusal of the pit boss to do this fored the men to strike.

Westville—The Dering mines have been reopened and it is rumored that the Bunsen people have taken them over, or else have secured a long-time contract to mine coal for the Dering people.

Indiana

Bicknell—Developments have been begun for two new coal mines by different companies in the Gibson County field. In the first place, the Big Muddy Coal Co., which abandoned the field west of this city about three years ago, and moved its houses to Bicknell, is preparing to open up again. Manager McClarrin

has been instructed to witness the cutting of the drill through No. 6 coal of the Fox farm, adjoining a deserted field on the northwest.

Secondly, the American Coal Co., of Brazil, has begun drilling land for a new mine on the 500 acres of land between Bicknell and Wheatland.

Bolivar—A record for hoisting coal has been made at the Glendoria mines recently, when 1008 tons of coal were hoisted in 8 hours. Samuel Dallzell is the mine boss and this is the third time that records have been broken under his direction.

Diamond—While digging a hole for a fence post on his farm recently, Leonard Bolliana struck a bed of coal only several feet below the surface of the ground. It was found that the coal had a good roof.

Indianapolis—Michael Halapy has lost his appeal from the decision of the special committee which found that Francis Feehan has been duly elected president of the Pittsburgh district of mine workers. Halapy's defeat dispels the question of Vice-president Van Bittner's right to the presidency after Feehan had resigned.

Jasonville—The Vivian Collieries have again resumed operation after a thirty-days' idleness.

Terre Haute—A special board of arbitration, which includes J. P. White, president of the United Mine Workers of America, and Harry Taylor, an operator from Illinois, recently announced that, hereafter, in drawing pillars in the Wabash mine, two miners shall be assigned to three places. But, if at any time during the drawing of the pillars a condition shall arise that threatens a loss of coal and the same can be conserved by granting the men affected the right to load out in excess of their regular turn, this shall be granted, with the understanding that, when conditions become normal, the turn shall be equalized.

In an opinion to State Mine Inspector Frank I. Pearce, T. M. Honan, attorney-general for Indiana, interpreted the Act of 1905, providing for proper ventilation of coal mines, to apply also to mines where a section has been walled off after operations in such parts have ceased. Mr. Pearce has found examples of mines so walled off and gas had accumulated behind the walls, causing a menace to the mine employees, and, as a result, he may require the mine owners to ventilate the walled-off parts.

Iowa

Albia—Another new coal mine has been added to the list of mines in Monroe County. The Maple Coal Co. has sunk a shaft, in Pleasant Township on what is known as Vance Farm. The coal is 56 in. thick and is said to be of superior quality. Another shaft is to be sunk immediately.

Oskaloosa—The new coal shaft which is being sunk out in the northwest corner of Pleasant Township is down to coal and work will probably soon be commenced on the tower. The mine will be operated by the Maple Block Coal Co., of Des Moines.

Kentucky

Ashland—Officials of the Chesapeake & Ohio R.R., the Baltimore & Ohio R.R., and others, have left for Ashland, to arrange transportation and traffic details for handling coal through the Cincinnati-Toledo gateway.

Burgess—The Haynes Coal Co. has sold its mine near here to the Vanducker Coal Co., of Roseland.

Lexington—A large trestle belonging to the Roes Mine in Bath County, where 200 miners are on strike, has been blown up. A railroad tie heavily charged with dynamite was discovered just in time to prevent a train from being wrecked. The company has placed an additional guard around the plant.

Pittsburg—The Patton Coal & Mining Co. is now engaged in taking its annual inventory of stock—a task which usually requires a month's time.

Wallsend—Five new mines are to be opened up by the Continental Coal Corporation upon its properties, as the result of work of improvement which will commence about July 25. This enlargement will give the Wallsend mines an annual production of 1,500,000 tons of coal. W. L. Morse is manager of the Continental interests.

Louisiana

New Orleans—The New Orleans Transportation Co. has ordered two new barges which will receive coal from the railroads and carry it to vessels about the harbor. A prominent coal company of Birmingham is financially interested in the new company and expect to profit by increased facilities for handling coal at New Orleans.

Missouri

Springfield—The Interstate Association of Retail Coal Dealers, including the states of Missouri, Kansas, Oklahoma and Nebraska, will hold a convention here August 28, and 29.

Stahl—H. C. McCahan is now sinking two coal shafts on his land west of here and expects to sink three more soon. Mining experts say that the beds underlying the new field are as good as those under the old mines. Mr. McCahan expects to build a spur track from the Q. O. & K. C. R.R., to his new mine.

St. Louis—It is understood that the St. Louis Electric Terminal Ry. of the McKinley road will ask permission to haul coal over its tracks, west of Broadway, between midnight and daybreak. When the line began to operate, it was announced that eventually it would apply for the privilege of hauling coal to St. Louis industries. At present it hauls a small amount of coal to the west bank of the Mississippi, where it is dumped into huge bins and carted away.

Montana

According to the present figures of the U. S. Geological Survey, the coal fields in the Bull Mountain section, Musselshell County, originally contained in beds 14 in. or more in thickness, 4,797,200,000 short tons of coal. A small part of this quantity has already been mined, but by comparison with the total coal content the amount is almost negligible. Only 60 per cent. of this coal, however, can be expected to be put on the market because of waste in mining.

Ohio

Bellaire—It is said that the Gorrell Mine, of which W. G. Simpson is acting as receiver, has been sold to the Grand Trunk R.R., which also controls the Rail & River Mine. The output will be used primarily for the company's own fuel, but incidentally for the business along its line. The consideration was $137,500.

Columbus—A plan for the reorganization of the Superior Coal Co. has been completed by the bond holders committee. After a careful consideration of the situation of the coal property, the committee decided that the best plan would be the organization of two companies, one to be known as the New Coal Co. and the other as the Development Co.

It is expected that within a short time Governor Harmon will announce the appointment of a mine inspector to succeed George Harrison, the Republican incumbent, whose term expired last week.

Coshocton—The project of developing fields of cannel coal in the vicinity of Warsaw and Newcastle is advancing steadily. It is said that a party of Pittsburgh buyers expect to lease between 1500 and 2000 acres of land and begin operations at once. A bed of coal 75 in. thick lies under all the lands.

Logan—The Kittanning Mines of the Star-Hocking Coal Co. has resumed operation after a shut-down of several weeks. The company recently installed a $50,000 coal washer which is now in operation. The concern is now in the hands of a receiver.

Toledo—For the week ending July 19, the Toledo docks loaded 115,000 tons of coal as compared with 88,000 tons of the previous week. Since the opening of navigation, the docks have loaded 1,132,346 tons.

Pennsylvania

Anthracite

Avoca—Nine men were burned by a gas explosion which occurred in the

Langcliff colliery of the Delaware & Hudson Co., July 18. It is supposed that the gas was ignited by a naked lamp.

The Connell shaft of the Hillside Coal & Iron Co. has suspended operations for an indefinite period owing to the fire which has been raging for some time in the lower vein, and which so far, there has been little effort to control. Over one hundred men and boys are thrown out of employment by this suspension.

Conyngham—The Harvey mines near here, which have been abandoned for about ten years are to be reopened. The mines became flooded with water and the former operators abandoned the section. The new company has sent a carload of pumping machinery to the mines, and their engineer after a careful investigation, said that there was a 12-ft. bed of coal, and profitable mining could be accomplished. A Southern capitalist is said to be backing the scheme.

Pottsville—An outcrop of a substantial bed of valuable coal has been struck by laborers while digging a trench for the Pottsville Water Co., on Minersville Street, in front of the Court House. Tons of the mineral have been shoveled out only three feet below the surface. Other discoveries of coal have been made near the surface recently, and indicate that surface mining would be a great success here, except for the closely built-up town.

Scranton—The public spirited citizens of this city are advancing funds with which to fight the reckless mining of coal under the city streets and property.

Wilkes-Barre—A heavy explosion of gas in No. 4 tunnel of No. 3 shaft at No. 5 colliery of the Lehigh & Wilkes-Barre Coal Co., at South Wilkes-Barre, July 17, caused the death of four miners and serious injury to four others. It is believed the explosion as far as could be learned was caused by one of the miners firing a blast, a spark from which ignited a pocket of gas. The force of the explosion was so great that it hurled the men in all directions and wrecked a large portion of the mine. Rescuers went promptly to work but it took some time before they could move the débris and reach the bodies of the dead and injured.

No. 5 mine is one of the most gaseous in the region and extra precautions have always been taken by the officials of the company to guard against explosions.

Another cave-in occurred here recently, more threatening than the former settlings. The cave occurred near the John Wilcox Estate on Abbott Street, and has been threatening for several days. The ground about the place has caved before, but in this instance, the settling is in close proximity to the houses and dangerous results are expected hourly. The ground is affected for a distance of one hundred feet.

BITUMINOUS

Connellsville—The Baltimore & Ohio R.R. officials declare that the collapse of the Sand Patch tunnel last week will stop traffic on the main line between Connellsville and Cumberland more than a month, and ten mines in Somerset County will have to close, throwing 5000 coal miners out of work. The Sand Patch tunnel is being replaced by a two-track tunnel of easier grade 300 ft. away, but this will not be completed until November. The present tunnel is 4777 ft. long.

The Pennsylvania department of mines, has taken up the decision of the Westmoreland County court, refusing an injunction against the gas company which is sinking a well through the workings of a coal mine, without taking what the coal company and the mine officials think are proper precautions against the escape of gas in the mine in case the well is brought in successfully.

One miner was killed and another fatally hurt in the Trotter mine of the H. C. Frick Coke Co. last week by a fall of slate.

Charleroi—There is an unusual demand for miners along the mines of the Monongahela Valley. The coal trade has opened up wonderfully during the last few months and operators are unable to get enough men to operate their mines to full capacity.

Greensburg—A letter from Dr. Holmes, director of the U. S. Bureau of Mines, states that, if at all possible, he will attend the first aid demonstration, to be held here August 7, and if not, he will send a representative.

Johnstown—The New England Coal & Coke Co. of Boston have purchased 400 steel hopper cars from the Cambria Steel Co., for delivery in August and September of this year.

The cars are the standard 50-ton type, but are specially designed for quick discharging at the tide water terminal. They are equipped with the most approved types of specialties, such as cast steel trucks, friction draft gear, Westinghouse air brakes, etc., together with the latest improved safety devices as required by the Interstate Commerce Commission.

West Virginia

New Martinsville—An unusual stratum of material was found in the excavation for the Clarksburg Northern R.R., at the crest of the dividing ridge between the head waters of Point Pleasant Creek and the Ohio River. About eight or ten feet below the surface a material, which was almost coal-black in color, was encountered. Many different opinions were expressed as to its identity. A specimen was sent to the U. S. Geological Survey at Washington, and a letter was received stating that the specimen consisted of a very sandy peat containing large numbers of minute plant fragments, including a variety of seed, pieces of bark, and portions of leaves. With them are the parts of wings of some insect, very likely a beetle. The letter says: "The stratum from which the specimen was obtained is evidently of a very late geological age, quite different from the hard rock formations of the state. Presumably the deposit is pleistocene."

The excavation is now well into the formation, and no signs of its exhaustion. Near this point, in a soft rock formation, a petrified log was found. The formation of this dividing ridge, which is only a few feet high on the Point Pleasant Creek side, is of a very peculiar character, and a study of it by experts might develop some very interesting facts about some important periods in the past.

Moundsville—Two of the 11 men rescued alive at the Panama mine last week have good chances of recovery, although one may be an invalid all his life because of the burns which extended over his entire body.

China

The existence of a considerable quantity of coal in the hills in Kaying subprefecture has been known to the natives for many years. However, beyond a few surface workings, no attempt has been made to mine. Some time ago, certain of the gentry and merchants of Paokan, Kaying, filed an application to work these mines in a modern manner. The head of the prefectural industrial bureau was instructed by the executors to make a surface survey to determine the ownership of the land on which the workings would be located, but he returned from the fields without accomplishing anything beyond compiling a list of men, probably land holders, who objected to the proposed workings. He then notified the obstructionists that he had appointed two deputies to make the survey, and that it would be carried out on April 29. The deputies, however, made the survey on the 28th without giving the obstructionists a chance to appear. This makes it doubtful if any progress can be made with the scheme in the face of local opposition. The principal commercial difficulty in the working of these mines, however, is in the lack of adequate transportation facilities. At present, water transport for small boats drawing not over 18 in., is available to within a few miles of the hills. On the other hand, should the proposed Canton Shanghai Trunk Line materialize, a short spur line might be built to the fields.

Germany

Halle—One man was killed outright and seven others severely injured on July 19, by an explosion of coal dust as the result of a fire at a lignite colliery near here.

Personals

J. G. Wolfe has been appointed Western manager for the Hutchinson Coal Co., of Claremont, W. Va., to take the place of W. M. Wright, who has resigned.

A. M. Mace, a mining expert of Pittsburgh, Penn., recently paid a visit to Whitely City, Ky., prospecting coal lands which are to be developed by a Pittsburgh company, in the near future.

P. R. Johns, superintendent of the Keystone Coal & Coke Co.'s mines at Clairidge, Penn., has been appointed superintendent of all the gas-coal mines in the Madison fields. He will reside and have his office at Darragh, Penn.

On Saturday July 13, the employees of the Pittsburgh Gas Coal Co., of Iselin, Penn., gave an informal luncheon in honor of John Reed who has just resigned as general manager. The program of the evening included music, followed by an address of welcome by Louis Thomas. In the course of the evening Mr. Reed was presented with a finely engraved watch and diamond ring by C. B. Cranmer in behalf of the employees, while his daughter received a handsome bracelet.

Mr. Reed has been associated with the company for thirty years. He started in as weighmaster and gradually rose to the position of general manager. Mr. Reed and his daughter are planning to sail for Europe on the 20th of this month.

Industrial Notes

The new Koppers type gas coke oven plant which is being constructed for the Coal Products Manufacturing Co., of Joliet, Ill., is scheduled to begin operations Oct. 1, 1912. Considerable attention is being focused on this plant at this time as it is the first of its kind in this country. Producer gas will be used to fire the ovens.

The Sullivan Machinery Co., of Pittsburgh, manufacturer of mine and quarrying machinery, announces that since May 1 it has established for the convenience of its customers in West Virginia, Virginia, southern Ohio and eastern Kentucky, a complete stock of parts and supplies for Sullivan continuous electric undercutters, compressed-air punches, rock drills and hammer drills, at Huntingdon, W. Va.

Official announcement was made at Edmonton, Alberta, on July 8 that before the close of 1912 three of the collieries served by the Alberta branch of the Grand Trunk Pacific Ry. now being built under the guarantee of the Provincial Government will have direct connection with the main line and will be turning out large quantities of coal regularly. From three to five cars of coal will be shipped daily by the Yellowhead mines and three cars daily by the McLeod collieries next fall.

Publications Received

THE SLAGGING TYPE OF GAS PRODUCER, with a brief report of preliminary test. By Carl D. Smith. Technical Paper No. 20, U. S. Bureau of Mines, 12 pages, 6x9 in., 1 illustration.

WATER SOFTENING AND PURIFICATION FOR COAL MINE OPERATIONS. By J. C. William Dreth, 14 pages, 6x9 in. Compliments of William B. Scaise & Sons Co., Pittsburgh, Penn.

GAS ANALYSIS AS AN AID IN FIGHTING MINE FIRES. By George A. Burrell and Frank Seibert. Technical Paper No. 13. U. S. Bureau of Mines. 16 pp., 6x9 in., illus. Government Printing Office, Washington.

DAS RETTUNGSWESEN IM BERGBAU, SEINE TECHNIK UND GESETZLICHE REGELUNG IM IN- UND AUSLANDE, by O. Pütz. 175 pages, 6x9 inches, with 150 illustrations. Published by Craz & Gerlach, Freiberg in Sachsen. Price, 4 marks.

INVESTIGATION OF THE COALS OF CANADA, VOL. II. By J. B. Porter, R. J. Durley and special staff. 184 pp., 6¾x10 in., numerous photographs, drawings and tables. Government Printing Bureau, Ottawa.

This volume contains Parts VII, VIII and IX of the reports. Parts VII and VIII deal with tests of boilers and gas producers, respectively, and are by R. J. Durley. Part IX, by Edgar Stansfield, has reference to the work of the chemical laboratory.

Trade Publications

Bulletin 63-H, July, 1912. Published by the Sullivan Machinery Co. 6x9 in.; 32 pages, illustrated.

Bulletin No. 58-L, replacing 58-I, May, 1912. Published by the Sullivan Machinery Co. 6x9 in.; 40 pages, illustrated.

The J-M Power Expert; published in behalf of J-M packing, pipe and boiler coverings, and other power-plant necessities, by H. W. Johns-Manville Co., Cleveland, Ohio.

"Little David" Pneumatic Drills. 16 pp. Form 8007. Published by the Ingersoll-Rand Co., 11 Broadway, New York City.

The tool, very simple in construction, is adapted in its various sizes for all the ordinary work of the pneumatic drill—drilling, reaming, tapping, flue rolling and wood boring. The motor or engine is of the angular, four-cylinder, single-acting, reciprocating type, each pair of pistons being attached to opposite throws of a double crankshaft, and each acting in balance, insuring continuous smooth running. Machines are built reversible but can be made nonreversing by simply inserting a pin in hole provided in the throttle handle. The valve action is such that there is no compression of exhaust, no matter which way the drill is running. There is no loss of speed and power. Catalog is illustrated and shows machines in section and at work. A descriptive table gives the sizes and capacities.

Obituary

L. J. Willinger, a pioneer coal dealer of Baltimore, Md., died at his home last week, at the age of 64 years.

Construction News

Minersville, Ohio—Work has been begun on the erection of a new tipple at the Pittsburgh mine here. George Bauer has the contract for the work.

Cambridge, Ohio—The Marietta & Lake R.R. is testing for coal in the territory east and north of old Washington. It is stated that a number of holes have been put down.

Barnesboro, Penn.—The Canfield Bituminous Coal Corporation is erecting a new power house as well as making numerous other improvements, at the West Branch Mine, at Barnesboro.

Paxton, Ind.—Work on a new coal shaft, east of here, was started during the past week by Wooley Coal Mining Co. This company is branching out and adding materially to its holdings, and increasing its output.

Newport News, Va.—Word has been received that the Chesapeake & Ohio R.R. Co. has awarded to H. C. Hoffman & Co. the contract for the construction of the steel superstructure of a new coal pier at Newport News.

Dunmore, Penn.—The new breaker at Dunmore, being erected by Alfred Harvey and W. Y. Moffat, is rapidly nearing completion. The breaker will have a capacity of about 200 tons per day, and will make a specialty of local trade.

Pineville, Ky.—With a capitalization of $50,000 the Magnet Coal Co. has been organized to develop mining properties in Bell County. Two hundred acres of land have been leased by the company, and it is expected that a mine will be opened by Sept. 1.

Moxham, Penn.—An 8-ft. electric rock drill is being installed at the Sunnyside Coal Co.'s plant. Power will be furnished by the Citizens Light, Heat & Power Co. The Sunnyside Co. is also planning to install a haulage system within a short time.

Seloca, Ala.—The Atlantic Coal Co. has been reorganized and incorporated to operate mines here. This company will work on the Jefferson seam, and a new slope, power plant, etc., are under construction. The capacity of the mines will be 600 tons of steam coal per day.

Shenandoah, Iowa—The Barclay coal sheds at the yards have been purchased by the Shenandoah Fuel Co., and will be remodeled and enlarged. The Shenandoah Fuel Co. will also rebuild their overshafts in preparation for a good business during the coming season.

Beech Grove, Ind.—The new block coal mine in Clay County, which is being sunk by the Corporate Coal Co., is nearing completion, and within a few weeks a large force of men will be put to work mining coal. The company has leased several thousand acres of coal land.

Lexington, Ky.—The Davies Coal Co. has been incorporated with a capitalization of $150,000 to develop mining properties at Louisville, in Mercer County and points east. Active work will be commenced by the new company when $50,000 of its stock has been subscribed.

Nashville, Tenn.—It is understood that the old Bonair Coal & Iron Co. is to be reorganized in the near future. The company was capitalized some time ago at $3,760,000, but its stock declined in value until reorganization is now imperative to further its operations. Four issues of bonds, aggregating $1,674,000 in value, are outstanding with the concern, extensive coal and timber tracks in White County, Tenn.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

Low prices are still being quoted in the bituminous market with buyers uninterested, while anthracite continues strong with supplies far below normal and no relief in sight. The receipts of hard coal are still much behind the demand and the movement for this month appears to have been even slower than the month previous. The shipments are about equal to those of previous seasons, but the requests are so heavy that many companies are only filling one-third of their orders.

There is an effort under way in the Eastern bituminous market to obtain higher prices, but it is doubtful if it will succeed unless a rigid curtailment in production is effected. However, operators are more guarded, shipments more nearly down to requirements, while free cargoes are seldom heard of and there is not the indiscriminate pounding of quotations so evident during the past few weeks. The strike of the steamer firemen is liable to cause a shortage at New England points, and result in an increase in the all-rail movement and higher prices.

The domestic demand in the Pittsburgh district is light, manufacturing hardly up to normal, and the Lake movement disappointing because of the congestion at the upper Lake docks which is backing coal up clear into Pittsburgh; the abnormal supply of slack, customary at this season of the year, is causing this grade to be particularly weak. The pool of the Connellsville coke men, who were endeavoring to force higher prices from the furnaces, broke during the week and furnace coke is again off.

In Ohio there is a greater activity in domestic which, coupled with the continued heavy Lake movement has resulted in a fairly strong market there; prices are ruling firm at the circular and production has been quite heavy. Business in West Virginia has been better than was expected; operators there, as well as in Alabama, continue holding firm on prices.

Premiums are being offered on some grades in the Middle West, and there has been evidence of a slight general improvement all along the line. However, more mines open up as the demand increases, so that prices are holding at a rather low level generally. Somewhat lower temperatures have prevailed which has tended to stimulate buying, and, aside from the low price level, conditions may be considered fair.

Boston, Mass.

There is apparent this week an effort to ask higher prices on Pocahontas and New River coals, but that so artificial an advance can be upheld in the face of a generally slack market is hardly to be expected. Only a rigid curtailment could make it effective, and it remains to be seen if a sufficient number of operators can be brought into line. Meanwhile, low prices are still being made and buyers are no more interested than they were a week or two ago. Large operators are certainly more guarded than they were, and the supply of coal on cars now, more nearly conforms to market requirements.

Georges Creek and the Pennsylvanias are unchanged. None of the shippers are loading any more for tide than there is called for and hence there is no surplus to be auctioned off. At the distributing points East, bituminous generally is in better shape; market cargoes are seldom heard of, and there is not the indiscriminate pounding that was manifest a few weeks ago. All-rail the movement is steady. The standard grades are all enjoying a normal business at about the same price level as last year.

The anthracite demand is still much ahead of the supply. Shipments to tidewater are even slower than in June, and both egg and stove are increasingly hard to get. It is hard to see how the situation can improve much at this late day, and the more farsighted are wondering what will happen when the big cities, like New York and Philadelphia, come in for their quota. The New York companies are doing little or nothing for this market, and the few cargoes arriving are a mere drop in the bucket. So far Eastern dealers have not had more than they would ordinarily receive by the middle of April.

Wholesale prices on bituminous are about as follows:

Clearfields, f.o.b. Philadelphia	$2.30@2.55
Georges Creek, f.o.b. Philadelphia	2.77@2.87
Pocahontas, New River, f.o.b. Hampton Roads	2.50@2.70
Pocahontas, New River, f.o.b. cars Providence	3.35@3.53
Pocahontas, New River, f.o.b. cars Boston	3.40@3.63

New York

Bituminous—The soft-coal market at this point continues dull and uninteresting with the movement confined almost entirely to contracts. The most interesting feature is a threatened car shortage; indications that such a condition was developing have been evident for some time and the past week has brought forth the realization. On the Pennsylvania Railroad it is said that the car distribution during two days of the past week was not to exceed 60% normal.

In the face of these rather low conditions, however,, the operators continue to maintain a feeling of optimism over the future. There is a fair amount of contracting still going on at average prices and consumers who are anticipating a heavy market this fall, and, hence not placing contracts, are now seeking to cover their requirements.

The spot market continues weak as follows:

West Virginia, steam	$2.35
Ordinary grades, Pennsylvania	2.45
Fair grades, Pennsylvania	2.55@2.65
Good grades, Pennsylvania	2.70@2.75
Best Miller, Pennsylvania	2.95@3.00
Georges Creek	3.15

Anthracite—The hard-coal market is still strong and active with supplies meagre and showing little indication of improving. Stocks of broken and pea are considered about comfortable, while chestnut is reported by some companies as fairly plentiful. In stove, however, there is an acute shortage and a heavy demand with no relief in sight. With a further 10c. reduction of the discount now only a few days off, buyers are displaying an unusual activity.

The companies are refusing to consider requests from any except their oldest customers and are even unable to furnish them with all they require. Production at the mines is said to be about up to normal, but no surpluses are accumulating.

The New York anthracite quotations continue about as follows, those for the Lackawanna and Wyoming being at the upper ports, and the Lehigh and Schuylkill for the lower:

	L.&W.	L.&S.	Circular
Broken	$4.80	$4.75	$4.75
Egg and stove	5.05	5.00	5.00
Chestnut	5.20	5.15	5.25
Pea	3.50	3.45	....
Buckwheat	2.75	2.45	....
Rice	2.25	1.95	....
Barley	1.75	1.70	....

Pittsburgh, Penn.

Bituminous—The local coal market continues dull, domestic demand being extremely light and requests from manufacturers hardly up to normal. Competition is rather keen, and prices are being cut on much of the business. The movement in the Lake trade is somewhat

disappo'nting, there being a congestion at upper Lake docks which has backed up coal to this point, and railroad yards between Pittsburgh and Lake Erie are crowded. We repeat former quotations, subject to considerable shading: Nut, $1.10; mine-run, $1.15; ¾-in., $1.25; 1¼-in., $1.35; slack, 50@75c. per ton at mine, Pittsburgh district. The market for slack is particularly upset, it being impossible to dispose of the slack arising from the heavy Lake shipments except at great sacrifices.

Connellsville Coke—The Connellsville coke operators, who have been consistently holding for $2.50 for second half furnace coke have split into two factions. One of these is a Pittsburgh coke firm which controls some production and has made large contracts, while the other is made up of a number of the operators who propose disposing of their output through a Uniontown brokerage firm.

In the movement of coke for July some of the operators who are holding for $2.50 on contract yielded slightly and made sales at cut prices, while furnaces bought considerable off grade coke and also took coke from other regions. There is no doubt that this movement of the Connellsville operators for $2.50 for second half coke was resulting in a decided increase in production in other regions, particularly in the so-called "mountain" district of Pennsylvania and in West Virginia.

On account of the present uncertainty furnaces are not buyng but even asking prices are lower as follows: Prompt furnace, $2.25; contract furnace (asking) $2.25@2.35; prompt foundry, $2.40@2.50; contract foundry, $2.40@2.75, per ton at Connellsville ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending July 13 at 375,557 tons, an increase of 45,000 tons, and shipments at 4320 cars to Pittsburgh, 5976 cars to points west and 950 cars to points east, a total of 11,246 cars, an increase of 1500 cars.

Philadelphia, Penn.

The retail trade in this vicinity does not seem to improve very rapidly. There is still an insistent demand for stove coal but outside of this, the trade is rather sluggish, and no improvement can be looked for until fall.

The wholesale trade, on the contrary, still continues excellent, the demand for all sizes being heavy. The operators have large numbers of orders unfilled, on which they seem to be unable to make any impressions, and it will be well on into August, before there is likely to be any easing up in the situation. Orders for certain sizes are being turned down, as it would be useless to accept any more with so many on hand.

Baltimore, Md.

About the only improvement reported in the Baltimore market during the past week, was the slightly better demand in the line trade—that is, in strictly all-rail business. But even this has had no appreciable effect on prices, which continue weak, to say the least. All grades of coal can be purchased at low-level prices, and slack, sold during the week at as low as 35c. per ton.

Shippers of tide-water coal are now facing a strike among the vessel firemen, which is delaying contract shipments to Boston and other New England points. Ships, which, under normal conditions, usually make three trips per month, between Baltimore and New England, are now running at the rate of two trips per month. Local shippers say that if a settlement is not soon effected, New England points will go short of coal, unless they resort to all-rail shipments, which will mean that their fuel will cost them considerably more.

The movement to the Lakes is heavy and will continue so until the late fall. The railroads are providing plenty of cars, in fact really more than the trade has any need of.

Buffalo, N. Y.

The bituminous trade is improving, slowly, but steadily, and but for the great surplus of Pittsburgh slack the general trade would be in very fair shape for the time of the year. This is because the March stocks have now about run out and consumers are nearly all in the market again. The consumption is large and quite a number of mines in the Allegheny Valley, which have been idle, or nearly so, will start up soon. These idle operators have, as a rule, kept their regular trade by jobbing, and, in most instances, come out with a better profit than if they had run their mines right along.

What is to be the outcome of the slack situation is not easy to tell, for the weakness of Pittsburgh slack is echoed in West Virginia, where slack is offering (by letter to Buffalo jobbers) at ridiculously low prices. On the other hand there is quite a scarcity of Allegheny Valley slack, odd as that may seem. In fact there is now complaint from some of the operators in the Valley that they are short of men.

There is more buying of coal by the railroads, the decrease of idle cars also showing that they are busy. Prices are a trifle stronger at former figures, $2.57½ for Pittsburgh three-quarter, $2.47½ for mine-run and $2 for slack, with Allegheny Valley 15 to 25c. lower. Coke is strong at $4.50 for best Connellsville foundry. Everything in the market indicates that business is slowly, but steadily improving.

The anthracite situation is no better. The demand increases, but the supply is not up to the average of former seasons. Some shippers in the large companies confess that they are not filling more than one-third of their orders and they see no prospect of improvement. A Western coal man, who has covered the upper lake markets, says that there is no surplus of anthracite there and receipts are much smaller than the average of former seasons. The situation is such that one shipper suggested that local dealers go out of the Canadian market entirely till their own consumers are supplied.

Cleveland, Ohio

There is little interest in the soft-coal trade. The marked dullness which has prevailed for some time past continues, and there is no improvement in prices. Considerable stock was offered during the past week, with few buyers, although prices were cut very low. This surplus stock is the result of the demand for three-quarters for Lake shipment and consequently very little stock was shipped here.

Lake coal carriers are more plentiful than cargoes and a number of local shippers have received orders to let up on shipments. There will be no change in market conditions until there is a better movement from the upper Lake Docks, and the coal men do not look for much improvement along that line until the latter part of next month. Some shippers are behind on their schedules, and they will have to move coal rapidly during the latter part of the season to make good on their contracts. The ore trade has fallen off very considerably during the past week, owing to sales not being made as freely as in the past month or more.

Columbus, Ohio

Greater activity has been shown in the domestic market during the past week, which, coupled with the continuation of the heavy Lake trade, has caused a decided improvement in the Ohio markets. Dealers are now inclined to stock up a little and are also busy filling contracts to supply schools. Generally the market has been fairly strong, with indications of still greater activity in the immediate future.

Trade on the Lakes is one of the active points in the market. The movement to the Northwest is steady, as is shown by the records of the docks of the lower Lake ports. There is practically no congestion on the docks and the coal is moving steadily to interior points.

Steam business is showing an improvement, with a better feeling in manufacturing circles generally. The requirements of some of the factories is larger, and, on the whole, the tone of the trade is better. Renewing of contracts is going on at the same rate which prevailed the previous year with the added cost of mining in-

cluded. Railroads are taking a larger tonnage now since the freight movement is increasing.

Production in the Ohio fields has been fairly large during the past week, especially in eastern Ohio and in the Hocking district, while Pomeroy Bend is coming forward with an increased tonnage. The domestic fields are preparing for a large production when the season opens up further.

Quotations in Ohio fields are:

Hocking Valley	
Domestic lump	$1.50
¾-in	1.35
Nut	1.10
Mine-run	1.15
Nut, pea and slack	0.45
Coarse slack	0.30
Pittsburgh No. 8	
¾-in	$1.10
Mine-run	1.00
Coarse slack	0.55
Pomeroy Bend	
Domestic lump	$1.50
¾-in	1.35
Nut	1.25
Mine-run	1.15
Nut, pea and slack	0.40
Coarse slack	0.30
Kanawha	
Domestic lump	$1.50
¾-in	1.30
Mine-run	1.10
Nut, pea and slack	0.50
Coarse slack	0.40

Hampton Roads, Va.

Hampton Roads may be a little early in striking its stride, but indications during the past week point to more than a temporary spurt. Business has been even better than could be expected; at each of the three piers this week the volume has been large enough to cause delay to some vessels reporting for coal—an unusual occurrence for the month of July. It is reported that the New England market has been enlivened by orders from many mills, which are suffering for water power on account of the drought, and are compelled to use steam. A heavy tonnage has been moving to New England from Hampton Roads during the week.

For foreign export alone there were 50,973 tons dumped and 15,584 for bunkers. The dumping goes on rapidly as the railroads are moving coal to tidewater with good dispatch. A slight indication of a car shortage could be noticed at the mines, but the railroads attribute this to the great number of cars that were tied up at tidewater earlier in the month.

While some low-price coal is moving out of the local harbor, in view of the good prospects for a stronger market, shippers here are declining to enter into any contracts at less than circular price.

Charleston, W. Va.

The demand here is strong in all branches with the exception of splint. Prices are also strong, excepting for splint, while the companies have a goodly number of orders ahead. Part of the increase for New River, Kanawha and Pocahontas coal comes from southern markets—South American and other southern ports.

With the car supply good, shipments have been heavy, and there has been no loss through failure to dump at tidewater or the Lakes. The great demand for slack has been largely due to its adoption by some of the railroads. The Chesapeake & Ohio has installed a number of new engines, with automatic stokers that use only slack.

Birmingham, Ala.

The contracting during the past week has been the most satisfactory feature in this market. Prices are firm on contracts and quite better than at this time last year, but not so much better in actual profits for the reason that the increased wages to the miners absorbs most of the difference. Spot shipments are light and quotations are therefore largely fictitious for that class of business, but firm nevertheless.

A slight falling off in production for July is being reported. Some mines are on half time and one or two are shut down. The furnace demand for coal, however, is improving, and from all indications, there will be marked increase in the demand from that quarter within another month. One new furnace of the Woodward Iron Co. went in during the week.

Coal operators are looking for a marked increase in the August demand, especially from domestic dealers and cotton gins. The railroads used more Alabama coal during June than for the corresponding month of last year, and industrial consumption, generally, is larger than for some time.

Nashville, Tenn.

Business continues dull in this section, but beginning the first of August, there should be quite a large movement of domestic coal. Continuous rains in the large cities of Tennessee for the past four weeks, has retarded the usual summer deliveries and made business very quiet, as far as the movement from the mines is concerned.

There is very little improvement in the steam trade and prices remain practically unchanged since our last quotation.

Indianapolis, Ind.

The coal mining industry in this state continues good. The last pay-day the miners received the largest amount in the history of the industry. There has been no apparent change in the prices, nor in the tone of the market. Retailers, however, report a decided slump in Eastern coal, not so much in the price, but the slow movement. They are well stocked with anthracite, but it is being stored slowly.

The bumper crop to be moved, and the consequent scarcity of cars are having considerable influence upon the trade. The present shortage of cars is already being felt, and the anticipation of a growing shortage as the weather becomes colder is not pleasant to contemplate. Operators say they are convinced that the railroads are going to be short of equipment.

Indiana operators who are selling to retailers at points remote from the mines are using every effort now to get them to store. There is only an ordinary demand for steam coal. Generally speaking, the operators expect a good coal year and something above an average output.

Detroit, Mich.

Bituminous—Coal cargoes passing this point for northern ports are not numerous. It is predicted that the tonnage will fall away short of last month, and it is a fact that some shippers are behind. The steamer "C. G. King" was sunk with a cargo of coal at the lower end of the U. S. Pier at the Ste. Claire Flats. Work will begin immediately to raise her.

There are some very vigorous protests from the jobbers and shippers' of Detroit, because of a proposal made by the railroads entering this city to add an extra charge of $2 per car for reconsignment where order was not given the car before reaching here. The railroads are anxious to put the plan in operation by Aug. 15 and consideration has been given the proposition by the transportation bureau of the Board of Commerce.

Owing to the fact that the thermometer has dropped 30 deg., the prices are strengthening gradually. On West Virginia ¾-in. lump, quotations are $1.15; mine-run, $1.05 and slack 70c., f.o.b. mines. The other grades are as follows: Smokeless, egg and lump, $2; mine-run, $1.10; slack, 90c.; Hocking domestic lump, $1.50; ¾-in. lump, $1.35; mine-run, $1.15. Cambridge ¾-in. lump, $1.15; mine-run, $1; Jackson Hill lump, $2.50, all f.o.b. mines.

Anthracite—Hard coal is becoming very scarce, and some of the smaller dealers are now willing to pay a premium on certain sizes. The demand is keen all along the line. Grate, egg and stove are quoted at $7.50; chestnut at $7.75; pea, $6; buckwheat, $4.50 per gross ton, f.o.b. Detroit.

Coke—This article is becoming also very scarce. However, there is no change in the price, which remains at $5.15 on Connellsville and $5 on Semet Solvey, per ton f.o.b. Detroit.

Chicago

Premium prices continue to prevail on lump and egg coal with little of the product in sight. A few cars have been sold at $1.90 to $2, f.o.b. mines.

Increased business in splint is reported by the dealers and it is commanding $1.50 in Chicago. A large number of dealers are forwarding orders for anthracite coal

in order to obtain the July discount. The market for screenings has weakened, the price being 5c. a ton lower than last week. Prices for mine-run are steady to firm.

Prevailing prices at Chicago are:

Sullivan County	
4-in. lump	$2.47
Egg	2.37
Mine run	1.99½
Screenings	1.72@1.82
Springfield	
Domestic lump	$2.17@2.32
Steam lump	1.87@1.97
Mine-run	1.82
Screenings	1.57@1.62
Clinton	
Domestic lump	$2.27
Steam lump	2.12
Mine-run	1.92
Screenings	1.67@1.72
Pocahontas and New River	
Mine-run	$3.15
Lump and egg	3.95@4.05

Coke—Prices asked for coke are: Connellsville, $5@5.10; Wise County, $4.85 @5; byproduct, egg and stove, $4.75; byproduct nut, $4.55; gas house, $4.50.

St. Louis, Mo.

The price cutting still continues, and it is a problem as to how some of the shippers are going to come out. There is an increasing call from the country trade, especially in the Northwest. There is also a good movement of coal to sections where harvesting is going on, and were it not for the extremely low prices, conditions would be about fair. Anthracite is almost at a premium. Smokeless is in good demand, and coke moving fine.

The prevailing prices are:

Franklin County	
6-in. lump and 3x6 egg	$1.35@1.50
Nut	1.35@1.50
No. 2 nut	1.25@1.35
Screenings	0.90@1.00
Carterville	
6-in. lump and 3x6 egg	$1.20@1.35
Nut	1.15@1.25
Screenings	0.90@1.00
Mine-run	1.05@1.10
Washed No. 1	1.75
Washed No. 2	1.50
Washed No. 3	1.30
Washed No. 4	1.00
Washed No. 5	0.85
Mount Olive	
Lump	$1.15@1.25
Nut	1.00@1.10
Screenings	0.90@0.95
Standard	
2-in. lump	$0.85@0.95
6-in. lump	0.90@1.00
Screenings	0.65@0.70
Mine-run	0.85@0.90
Anthracite	
Chestnut	$7.25
Egg and stove	7.00
Grate	6.75
New River and Pocahontas	
Lump	$4.50
Egg	4.40
Gas House Coke	4.50@4.60
Byproduct coke	4.60

Portland, Ore.

We are now in the very midst of summer, and the weather is so warm there is little demand for coal. It is expected that a start will be made soon to put in winter supplies. Values are exactly as last spring and no vessels have yet been announced as due here the coming fall from Newcastle. A couple of vessels were announced this week as having been engaged to carry Australian coal to San Francisco, thence to come here light to load lumber or grain. High-grade coals are quoted $10, while the lower grades may be had as low as $6 per ton.

Production and Transportation Statistics

Exports

Exports of anthracite from this country for May of the current year amounted to 18,019 tons, as compared with 381,466 tons for the same month last year. Exports of bituminous coal, exclusive of bunker or fuel coal laden on vessels in the foreign trade, were, for May of this year, 1,486,214 tons, as against 1,211,789 tons for the same month last year. Bunker or fuel coal laden on vessels in the foreign trade during May of this year amounted to 692,584 tons, as compared with 618,229 tons during May last year.

Chesapeake & Ohio Ry.

The following is a statement of the coal and coke traffic over the lines of the C. & O. Ry. for May, and the 11 months ending May 31, 1912, in short tons:

Destination	May	11 Months
Tidewater	391,699	4,017,374
East	151,952	2,012,940
West	893,581	10,031,074
Total	1,437,232	16,061,388
Coke	25,157	215,707
From Connections		
Bituminous	13,661	198,125
Anthracite	364	33,555

Norfolk & Western Ry.

The following is a statement of tonnages shipped over this road from mines in West Virginia for the month of June in short tons:

Field	Tipple Coal	Total Coal
Pocahontas	18,528	1,296,657
Tug River	4,086	197,601
Thacker	4,340	227,230
Kenova	8,206	85,048

Shipments of coke originating entirely from the Pocahontas field amounted to 85,026.

Foreign Markets

Great Britain

No tangible change has taken place. Large coals remain steady and smalls are if anything weaker while inquiries for loading ahead are plentiful. Prices are approximately as follows:

Best Welsh steam coal	$4.26
Seconds	3.96
Thirds	3.66
Best dry coals	4.02
Best Monmouthshire	3.60
Seconds	3.36
Best Cardiff small coal	2.46
Seconds	2.28

The prices for Cardiff coals are f.o.b. Cardiff, Penarth, or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days, less 2½ per cent.

British Exports—The following is a comparative statement of the British exports for June, 1911-12 and the first 6 months of the current year:

	June 1911	June 1912	6 Months
Anthracite	183,150	189,973	974,193
Steam	3,846,978	3,928,199	18,720,167
Gas	858,468	1,161,590	4,487,837
Household	100,387	154,856	640,455
Other sorts	249,910	322,026	1,350,671
Totals	5,238,893	5,756,644	26,173,323
Coke	69,670	51,139	388,108
Patent Fuel	134,212	108,649	635,283
Coal, Coke, & Pat. Fuel	5,442,775	5,916,432	27,196,714
Bunker coal	1,674,456	1,561,215	8,125,897

Financial Notes

Lehigh and Wilkesbarre Coal Co.—This company has declared the regular semiannual dividend of $3.25 per share, payable June 14 to stock of record June 12.

Dilworth Coal Co.—The Greene County court at Waynesburg, Penn., on June 21, granted a decree of foreclosure in the suit brought by the Guarantee Title & Trust Co. of Pittsburgh, mortgage trustee. The amount found to be due is $362,500.

Island Creek Coal Co.—It is said that the directors of this company did not favor paying a dividend this year, believing that with a rapidly growing business it is the part of prudence to build up working capital. This company will earn for the current fiscal year to end Dec. 31 next, slightly over $5 per share on the common.

Reading Co.—This company's assets include the Philadelphia & Reading Ry., a profitable railroad proposition, the Philadelphia Coal & Iron Co., an apparently unprofitable coal company in recent years, though improving of late, ownership of 53% of the $27,436,800 capital stock of the Jersey Central and thus 53% equity in Jersey Central, 97% of the Lehigh & Wilkes-Barre Coal Co.

Jamison Coal & Coke Co.—Notice has been given by the Union Trust Co., trustee, that on July 1 it will redeem Jamison Coal & Coke Co. general mortgage 5 per cent. serial gold bonds to the amount of $1,754,000 at par and a premium of 2½ per cent. and accrued interest. The bonds to be redeemed are Nos. 371 to 2125, both inclusive. Interest on these bonds ceased July 1.

Cumberland Basin Coal Co.—The United States District Court at Baltimore on June 18 ordered the Continental Trust Co., as trustee, to sell the property at Barrelsville, Allegheny County, Md., under foreclosure of the $500,000 first mortgage of Jan. 2, 1907, the interest on which was defaulted Jan. 1, 1912; upset price $200,000. There are also outstanding $57,000 second mortgage refunding 5s. of 1909.

Utah Co.—The $10,000,000 6% five-year collateral trust gold notes of this company, guaranteed unconditionally by the United States Smelting, Mining & Refining Co., are being offered at par and interest. The issue is to pay for two-thirds or more of the stock of the Castle Valley Coal Co., the Black Hawk Co. and the Consolidated Fuel Co., three operating coal companies in Utah, and pay for the construction of a railroad 80 miles long, connecting the coal lands with the Union Pacific system at Spanish Fork, Utah.